..THE IRON AGE..

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# STABILIZATION WOULD PROMOTE DIVERSIFICATION

By GILBERT L. LACHER

MANY of industry's present ills are due to financial disturbances for which it is not responsible. But fixing the blame does not bring relief, and hence the question arises as to what, if anything, industry itself can do to improve its position.

The first practical measure that commends itself to industrial management is modernization, because it reduces costs at a time when there is a race between costs and prices. Another important means of combating depression is diversification.

A more diversified economy may be promoted by the stabilization of mature industries—the achievement of a degree of cooperation under which overdevelopment is forestalled and surplus capital and labor is diverted to other enterprises.

Diversification may receive direct impetus from the ingenuity and imagination of individual manufacturers. Instances of trade expansion through the development of new products and new uses for old products will be cited in our annual review number, to appear next week. Such increases in business not only benefit the sponsoring companies, but result in new demands for staple commodities.

To diversify is to create more work for our whole industrial system.

TOM, Dick and Harry were marooned on an island. Tom volunteered to climb trees and shake down cocoanuts. Dick gathered the nuts and Harry took out the meats and prepared them for eating. All went well until Harry, an ingenious fellow, devised a machine that shook down the nuts, gathered them and extracted their "innards" in one continuous operation. Tom and Dick were thrown out of employment. They said to Harry, "We've got to live. If each one of us takes his turn on the machine, the working time of all of us will be reduced two-thirds. The two-day week is the solution of our troubles."

But Harry couldn't see it that way. "If we do what you propose," he said, "none of us will have more than he had before. The logical thing is for you fellows to obtain other products to exchange for my cocoanut meats. Tom, why don't you try to catch some fish? Dick, why don't you devise a bow and arrow and shoot pheasants or wild boars?"

There is a lesson in the experience of these three men. The answer to our economic problems is not shorter working days or five-day or four-day weeks. Such measures help in reducing unemployment, but they do not raise the standard of living. Let us recognize the fact that our country has matured—that the days of pioneering new territories and duplicating the productive facilities of older sections of the country are over.

Most of our industries are burdened with excessive capacity. If we permit these industries to regulate production in relation to demand, capital will be forced into the development of new activities, which will provide employment and more goods and

services for exchange and distribution. If we merely divide up what we have, industry is doomed to stagnation. What is needed are new products, new industries, new forms of employment.

### Credit Control Important

It is obvious, of course, that in a complex capitalistic society it is difficult to bring production and consumption into harmony. In the decade preceding the stock market crash, the increased earnings that came from mass production created the illusion that capacity could be expanded indefinitely. Lower costs were counted on to make lower prices possible, thereby increasing consumption. Capital in a swelling tide went into the construction of new plant and equipment. This, in turn, provided employment and sustained enlarged consumption. Finally the enthusiasm of the "new era" took hold of the stock market and led to the disastrous securities inflation.

It is contended that more effective control of our credit mechanism would have prevented the excesses in the securities markets and at least checked the corollary overextension of industrial capacity. If such a credit stabilization could be achieved, it is argued, there would be no need for interference in the affairs of industry. Unquestionably there is much to support this view. But effective changes in our banking system are unlikely to be made overnight, and, even when they do become an actuality, they will probably not succeed in controlling the psychology of business men, which always exerts a powerful influence on credit fluctuations.

### Unrestricted Competition Leads to Concentration

Meanwhile there is much agitation for amendment of our anti-trust acts. To some extent this is undoubtedly a passing phase—a symptom of ailments growing out of the depression. But there are also indications that it reflects a fundamental change in our industrial development. Our Western frontiers have passed into history and population is no longer showing rapid growth. We have built our house and now we must furnish it.

In other words, industry cannot count on an expansion of demand arising from mere increases in the number of people; it must depend in the future on a growth in average purchasing power. It has become consumer-conscious. In its own employees it sees constituents of that important new factor, "mass consumption." It recognizes a new obligation to provide employment, not only to keep consumer buying power alive but to avoid releasing men, thereby making them public charges.

This new sense of responsibility to labor, together with the heavy fixed charges in mechanized plants, has intensified competition. Because it is cheaper to take orders at a loss than to shut down, a vicious spiral of declining prices is set in motion. The law of the survival of the fittest closes plants, throws men out of work and leads to mergers. These consolidations, forced by uneconomic competitive conditions, may have no relation to operating efficiency. In part, they may merely represent an effort to strengthen producers' bargaining power in dealing with large buyers or organized groups of buyers. In the end, in certain industries, the very insistence of our laws on unrestricted competition may lead to such concentration as largely to stamp out competition.

### Are Consumers' Rights Really in Danger?

As a question of public policy in relation to some kinds of enterprises, we seem to be faced with a choice between acceleration of the merger movement and some relaxation of legal restraints on competition. Fear of invasion of consumers' rights no longer has its old meaning. In the first place, in a highly industrialized nation consumer and producer are to a large extent identical. Low prices begetting low wages in one industry reduce consumer purchases from other industries. Secondly, the progress of mechanization is such as to put a premium on lowering costs and prices, to increase demand. It is only when competitive excesses in a given industry lead to overexpansion and idle capacity that the full benefits of such economies cannot be passed on to the consumer. In the third place, inter-industry competition is keen; in fact, there are few products for which an alternative cannot be substituted.

Leaders in some branches of manufacture oppose any change in our anti-trust restrictions because they fear that it would be the first step toward reducing their industries to a utility status. But others believe that stabilization can be achieved without imposing prohibitive restraints on competition. The plan proposed by the American Institute of Steel Construction has for its aim an equitable allocation of production without direct interference with prices. It places no bar on the building of new capacity or expansion of existing plant, but requires that penalties must be paid for production in excess of one's quota. This arrangement does not prevent the more efficient units from forging to the front but undoubtedly serves as a brake on additions to capacity and cut-throat competition.

### Diverting Capital to New Industries

The plan is worthy of particular consideration because it offers a practical means of checking unwise use of capital. If tariffs were justified at an earlier stage of our history to protect infant industries, penalties may be needed today to restrain capital investment in overdeveloped industries. Certainly it is plain that established industries cannot hope to advance unless new industries are built up. It is only by creating new outlets for capital and labor that demands for old products can be increased.

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The total cost of unemployment insurance in Great Britain in 1932-33, according to revised estimates of the British Government, will be $572,300,000, of which the Government will pay $384,500,000 and the employers and employees, $93,900,000 each. In addition to this annual expense the Government had loaned to the fund up to Sept. 1, 1931, a total of $495,900,000, reports the National Industrial Conference Board, New York.

# LINCOLN CAR PARTS HEAT TREATED WITH GAS

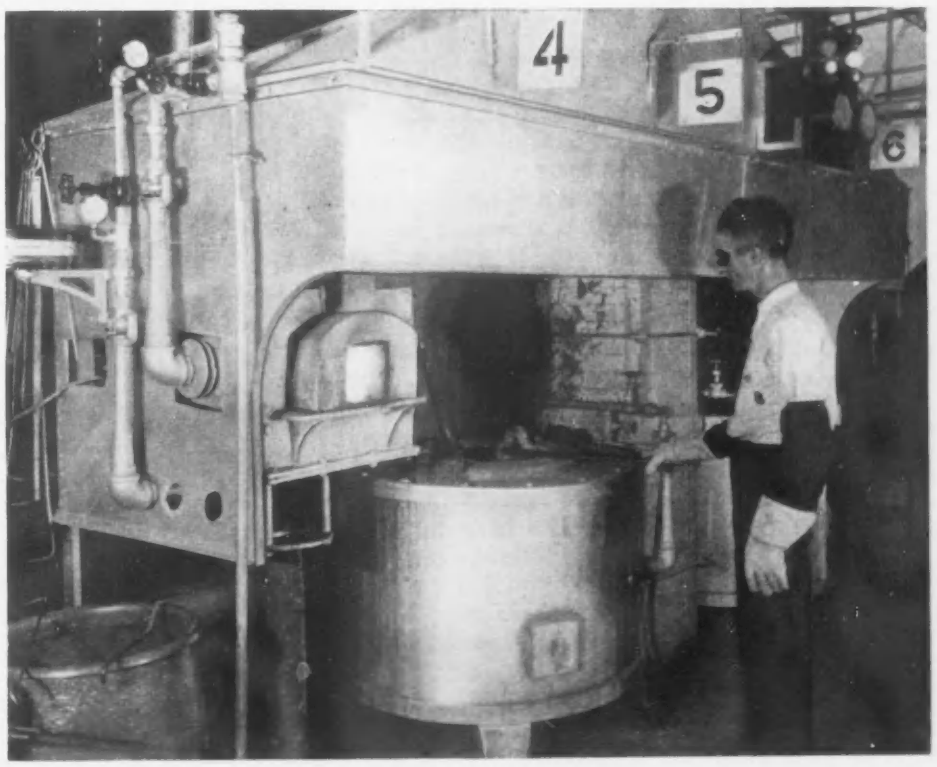
**CLOSE control of temperature in heat-treating furnaces used by the Lincoln Motor Car Co. is assisted by a system of telltale lights operating in conjunction with recording devices. These lights, which function within limits of about 10 deg. F. either side of the prescribed temperature, are visual signals of how well the equipment is holding to its allotted work. The furnaces are heated with gas, which is put in through inspirators set for definite gas air ratios. Regardless of the rate of gas burning, these ratios are maintained automatically for proper combustion conditions.**

By J. B. NEALEY
American Gas Association, New York

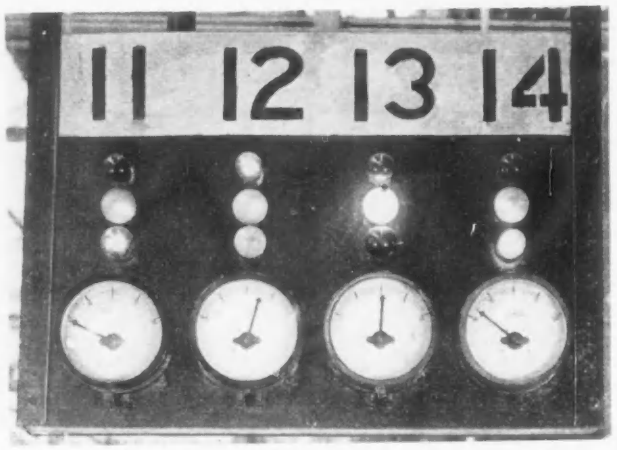
BEAUTY and performance in the Lincoln car are reflected in appearance and efficiency in the plant in which it is manufactured. The heat-treating division has come in for its share of modernization and stands today as a model department. More than 300 different Lincoln parts are heat treated here, and the fuel used in all of the furnaces, pots, etc., is gas.

The equipment is arranged in rows with wide aisles between, which provide plenty of room for material handling. One row consists of eight oven-type furnaces, each about 8 ft. long, 6 ft. wide and 4 ft. high, of brick construction and steel incased. They are under-fired with a gas burner at each end, the hot products of combustion rising up around the sides of the hearth, behind refractory baffles, into the heating chamber.

These burners are provided with inspirators and any predetermined ratio of gas and air can be obtained and maintained automatically, regardless of




OPERATOR heating selected portions of steel parts in lead pot. Note small preheating furnace at left.




Close-up of deviation meters and telltale light on heat-treating equipment.

which provides for circulation of air and also tends to prevent warpage of the trays. These trays are moved about with high-lift trucks and are susceptible of being stacked one above the other. The heated work is withdrawn into trays which are moved along to the quench by means of an overhead monorail.

At one end of this row of furnaces is a packing table where parts are packed into boxes with carburizing compound. They are also unpacked here. The packed boxes are loaded on to wheel trucks of the same height as the table and furnace hearths and rolled direct to the furnaces. Here they are charged into the furnaces with a dolly, consisting of two small wheels, several short, flat prongs and a long handle.

After carburizing, the boxes are removed in the

ROW of gas-fired cyanide pots and quenches.

any variation in the volume of flow of the combustible mixture. Control of temperatures is provided by the use of recording pyrometers and lights. The recorders for all of the heat-treating equipment are located in a central control room. These recording pyrometers maintain a constant and accurate record of all heat treating, and all batches are identified with this record in such a way that, if any part goes wrong, it can easily be traced through the heat treatment to ascertain whether the cause lay there or not.

At the furnaces now being described are two panels with four deviation meters on each. These meters have three lights apiece, red, white and green, which are progressively and automatically switched on when the temperature varies 10 deg. either way. Red indicates too hot, green too cool and white the correct heat. Two of this group of furnaces are provided also with automatic temperature controllers, including motor-operated valves in the gas supply lines. These furnaces are used interchangeably for a number of kinds of heat treatment, including carburizing.

All hot work is handled in trays with short legs. The bottoms are made up of spaced pieces of pipe,

Operator packing boxes with steel parts and carburizing compound. Compound cleaning machine in background.

same manner and after cooling are transferred to a compound cleaning machine. Here they are dumped into wire baskets, the work remaining in the baskets and the compound falling through into a box. This box is raised and the compound dumped into a rotating cylindrical wire screen, where the dust and fines are screened out, leaving the remainder for re-use.

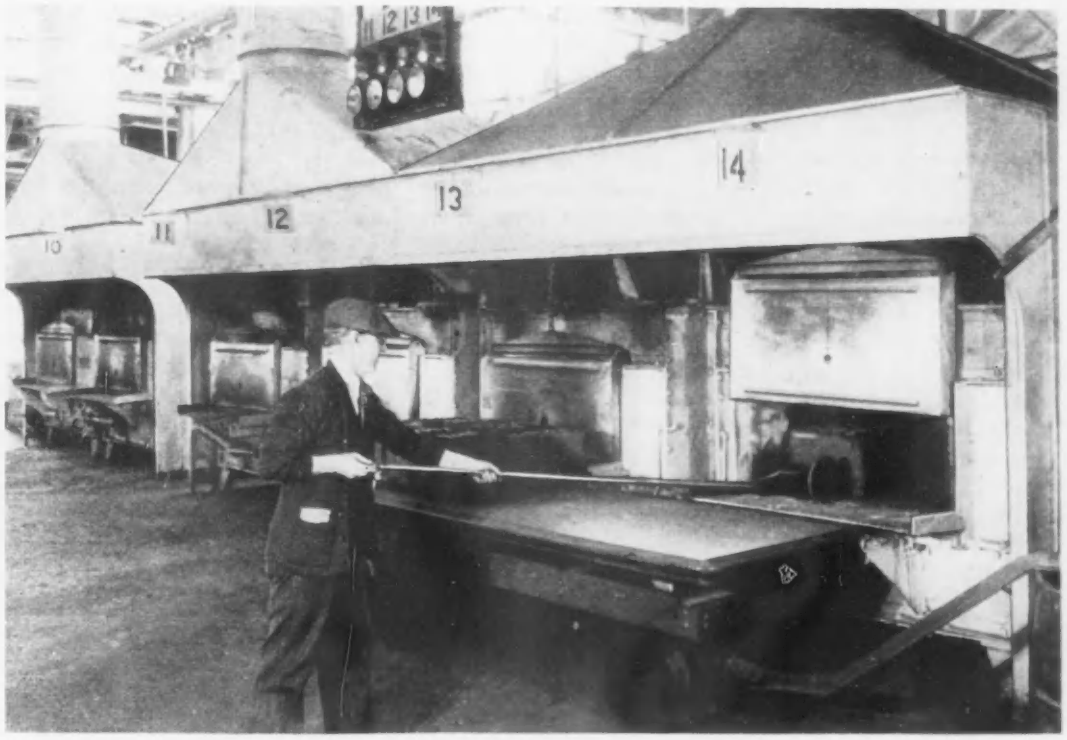
One of the parts carburized in these furnaces is the camshaft, which is made of S.A.E. 1015 or 1020 steel. This is packed in a box with carburizing compound and is heated in the box to 1730 deg. F., cooled in the box outside of the furnace and then unpacked. It is next reheated in a cyanide pot to 1450 deg. F., quenched in water and drawn at 350 deg. F.

Piston pins, of S.A.E. 2315 steel, are case hardened in carburizing compound. The first heat is 1730 deg. F. and they are cooled in the boxes and then unpacked. They next receive two heatings in cyanide, the first at 1550 deg. F. and the second to 1350 deg. F. and are quenched in oil after each heat. They are drawn for 30 min. in oil at 350 deg. F.

The cyanide furnaces are of brick with steel shells, and are about 5 ft. in diameter and 4 ft. high. They are hooded and hold the pots, which are about 2 ft. in diameter and 2 ft. deep. Each is heated with two gas burners set about midway from top to bottom. The waste gases are taken off close to the top by a brick flue and exhausted to the outside of the building. The burners are supplied with inspirators for single-valve control of gas-air ratios. The cyanide furnaces are provided with recording pyrometers and deviation meters similar to those previously described.

Close by are steel tanks containing water, oil and caustic quenches, with an overhead monorail serving all. The water and caustic quenches are equipped with air agitation, perforated pipes being located inside the tanks, close to the bottom, through which air is blown under pressure. The oil quenching is agitated by inflowing cooled oil.

The lead pots are located in brick furnaces with steel shells about $3\frac{1}{2}$ ft. in diameter and 3 ft. high. The pots are about 16 in. in diameter and 18 in. deep and are fired with a single gas burner to a pot. Small work to be hardened in localized places only is treated in these lead pots, and fixtures of various shapes and sizes to suit the work are used. A combination oil-and-water quench consists of a rectangular steel tank containing water in which sets a steel barrel of oil. Recorders, deviation meters and lights are provided.




ROW of gas-fired furnaces in heat-treating room, showing operator charging box of parts, to be carburized, direct from truck into furnace with a dolly.

Some of the forgings heat treated here still retain a little flash. For the removal of this a row of double-headed grinding jacks is provided, all with individual motor drives. The dust is removed by pipes to an overhead header and fan and exhausted to the outside of the building.

An air hammer and gas furnace are used for small miscellaneous forge work, the furnace being of brick inclosed in cast iron plates. It is 4 ft. long, 3 ft. wide and 2 ft. high, and has an opening in the top 8 x 10 in. One gas burner and heating chamber throws heat out through this opening and loose bricks are piled around it to suit the size and shape of whatever object is to be heated.

A complete chemical and physical laboratory is maintained close by where the analyses of raw materials are checked and the physical properties of the finished products ascertained. Experimental and research work is also carried on here.

# LARGE DROP FORGING OUTPUT I

IT is seldom that a metal-working concern, long established in business, finds its earlier plant arrangement and organization adequate for modern expansion. The Atlas Drop Forge Co., Lansing, Mich., is a notable exception. Founded in 1906, when the automobile industry was in its infancy, it has kept pace with the growth of motor car manufacture, but what is more remarkable is the fact that its plant was built for progressive manufacture without backtracking of materials at a time when mass production was a term yet unknown.

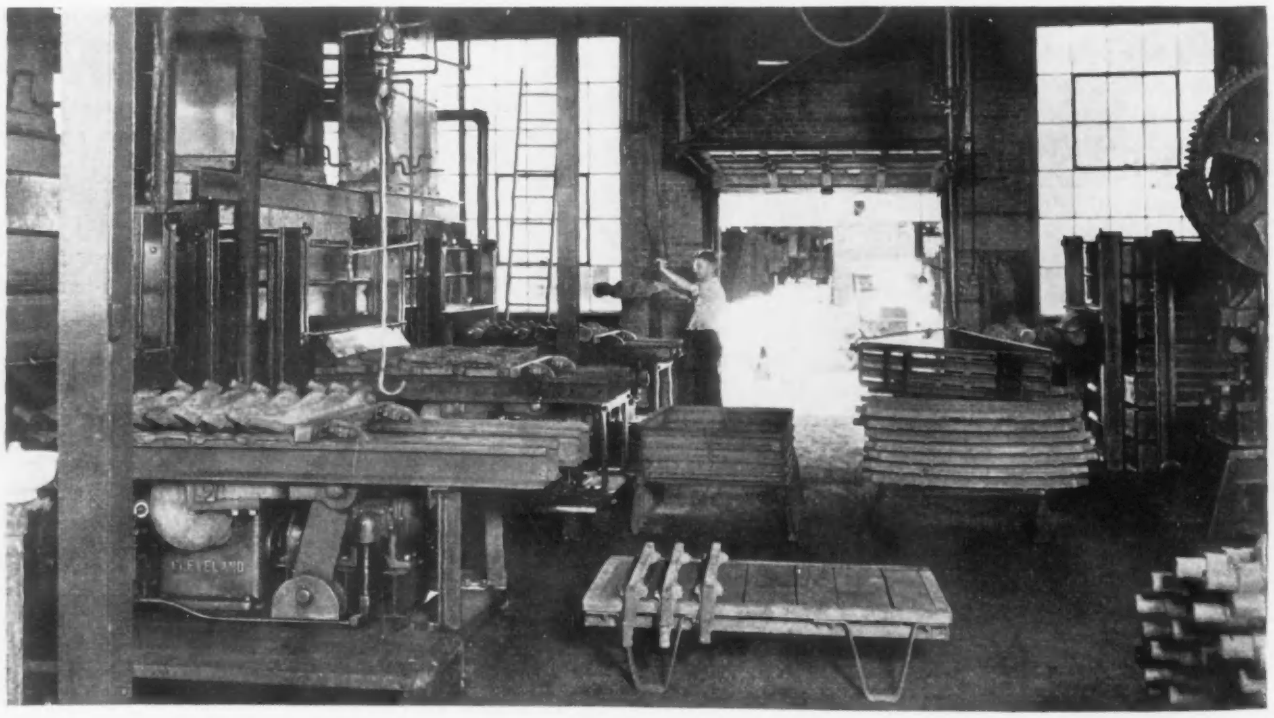
Its adherence to this principle has been steadfast through the years, with the result that today 5,000,000 lb. of drop forgings a month are being made in a minimum of floor space with modern equipment and are being heat-treated in furnaces of the company's own design. Materials are kept off the floor at all times, occupying large metal boxes or trays which are moved about by means of electric lift trucks. Plenty of room is available for future expansion without disturbing the economical arrangement of the plant.

### Designs Its Own Heat-Treating Furnaces

Because of wide variation in the weight and shape of its products, the Atlas company thought it advisable to design and construct its own heat-treating furnaces so as to obtain maximum efficiency and flexibility. Located on a direct line between the two forge shops and the shipping room, the heat-treating department numbers among its equipment a normalizing furnace, four quenching furnaces and four draw furnaces, all of the continuous, underfeed pusher type. Furnace casings are of steel, being built of channel beams bolted together; upon completion of construction work, the entire structure is clamped together with heavy double channel beam buckstays.

Furnaces which heat forgings for quenching discharge directly into the quenching tank through an air-tight slide, the end of which projects under the quenching solution, forming a seal so that no cold air can be drawn into the hot end of the furnace.

At the charging end of all furnaces are stacks extending through and above the roof, which serve a three-fold purpose: first, conducting waste gases and heat outside the building; second, preheating the burner air in a recuperator constructed inside the stack; and third, establishing a proper heating and soaking zone for whatever grade of steel or type of forging is to be heat treated. This is done by the operator, by manipulating dampers in the stacks,



Some forgings are pushed through furnaces on light-weight carrier shoes. Air hoists are used to transfer forgings from shop platform to furnace rails.

# IT IN MINIMUM SPACE

thus drawing the hot flame from the back end toward the front of the furnace.

Air hoists are used to transfer forgings from shop platform to the furnace rails in front of the pushers, and also to move forgings from the normalizing furnace to the quenching furnaces. Forgings weighing up to 500 lb. are taken from the quenching tanks by heavy-duty conveyors. Air hoists then transfer the material from the conveyor to the rails in front of the drawing furnaces. Some of the forgings are pushed through the furnaces on lightweight carrier shoes; others are put through on trays made of heat-resisting metal. It is desirable to use the shoes whenever possible, because the heating of the metal trays cuts down the economical operation of the furnaces.

**All Furnaces Automatically Fired**

Furnaces are automatically fired by operating valves controlled by combination recording and controlling instruments mounted on the latest type of switchboard. This switchboard is located in a room 10 ft. above the floor level, well provided with windows so that the supervisor can have his department under close observation while checking instruments and inspecting record sheets.

**THE Atlas Drop Forge Co., Lansing, Mich., built its plant for progressive manufacture without backtracking of materials at a time when mass production was a term yet unknown. It manufactures 5,000,000 lb. of drop forgings a month in a minimum of floor space, with modern equipment including heat-treating furnaces of its own design.**

At the discharge end of each draw furnace is a hydraulic press for straightening many different types of forgings while they are still hot. A board hammer is located nearby for forgings which must be restruck while hot.

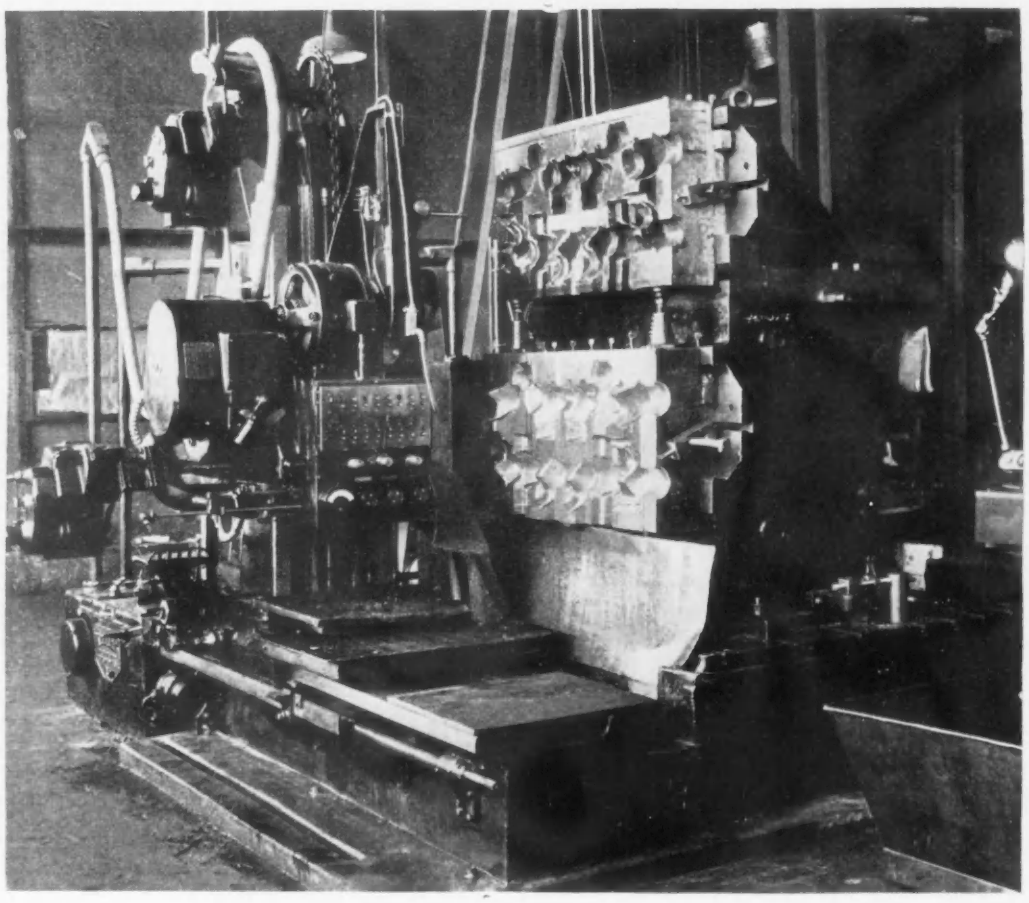
Heat-treating operations are controlled by the metallurgical department. When steel is received at the plant, a large number of samples are cut from the ends of the bars and sent to the laboratory, where some are checked for chemical analysis, others are deep-etched to determine density and segregation, still others are carburized to check grain size and others are drawn out under a hammer to be heat treated to check physical properties.

When steel is accepted, every bundle is marked with a rust-proof metal tag. Forgings made from

Forgings are discharged from furnaces directly into quenching tank through an air-tight slide the end of which projects under quenching solution. A conveyor takes forgings out of quenching tank.

every heat bear an identification mark, known to the heat-treating department, which enables it to make full use of all laboratory records of the characteristics of the steel being treated. This information is of assistance in determining the proper temperatures for normalizing, annealing, quenching, drawing and the time of the cycle.

The department is housed in a building 59 x 169 ft. of brick and steel construction. The steel-decked roof has ventilators of sufficient capacity to change the air in the building 30 times an hour. Provision has been made for additional furnaces, if needed; in this plant layout is sufficient space for a second heat-treating building as large as the present one without interfering with the transportation of forgings or causing back hauling in the movement of forgings from hammers to shipping room.



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DIE shop is equipped with Keller automatic die sinkers, as well as high-production shapers and planers. (Left).

* * *

A COMBINATION shaper, planer and boring machine is used for heavy maintenance work. (Upper right).

* * *

AT discharge end of each draw furnace is an hydraulic press for straightening hot forgings. Board hammer is nearby for forgings which must be restruck while hot. (Lower right).

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### Pickling Department Well Ventilated

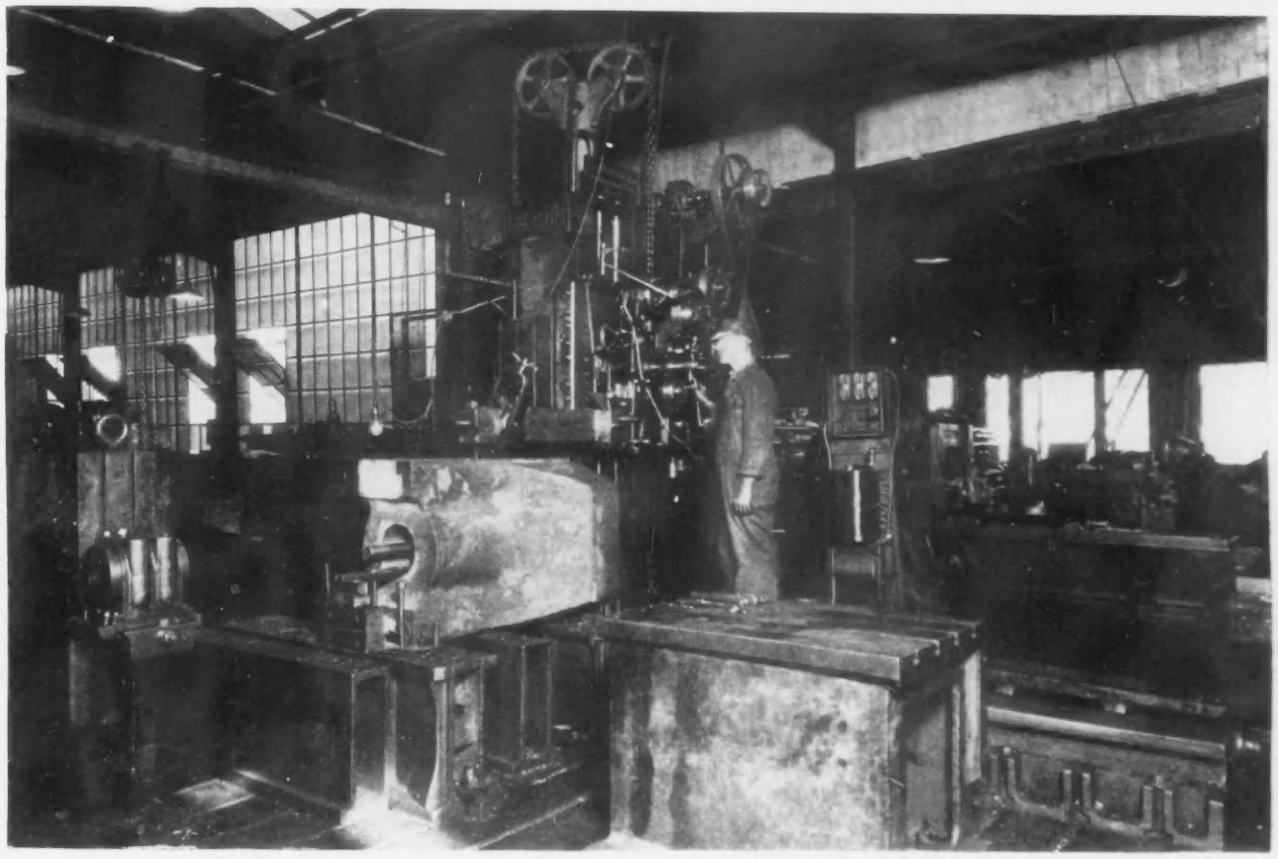
At the end of the heat-treating building is the pickling department, 22½ x 24 ft. It has a solid concrete sub-floor 5 ft. below the working floor; in the sub-floor are built piers on which the acid vats and washing tanks are set. The working floor consists of 2 x 4-in. pine placed on edge. Ventilation and heating of the building, especially to prevent steaming in winter, is accomplished by forcing hot air between the floors and allowing it to rise around the vats and tanks, passing out the ventilators in the roof, which have a capacity of 60 air changes an hour. All steel work, such as columns, trusses, ventilators, crane tracks and wash tanks, are heavily coated with acid-resisting paint. Acid vats are made of timbers clamped together with bolts of acid-resisting metal.

Test plugs, made of a size having the same cross-sectioned area and from the same heat of steel as the forgings, are heat treated with the forgings to make sure that the time and temperature cycles are right. They are tested periodically for physical properties, depth hardness and micrographic structure. At half-hour intervals two forgings are taken from each quench and draw furnace, checked for hardness and a report is made to the supervisor so as to prevent excessive rejections by the inspection department on account of defective heat treatment.

When the heat-treating process and auxiliary operations (such as hot straightening or restriking) have been completed, forgings are placed on racks or in baskets and taken to the pickling department. There the cleaning process consists of a dip in a sulphuric acid solution, a wash in a mild alkaline solution and a final wash in boiling water. This leaves the surface of the forgings in such condition that defects, such as seams, can readily be seen by inspectors.

### Dies Made by Special Machinery

The die shop, adjacent to the steam hammer forge shop, is equipped with the latest die sinking machinery, including high-production shapers, planers and Keller automatic die sinkers. Dies are delivered to the forge shop on elevated electric trucks. The shop office and maintenance department are in the

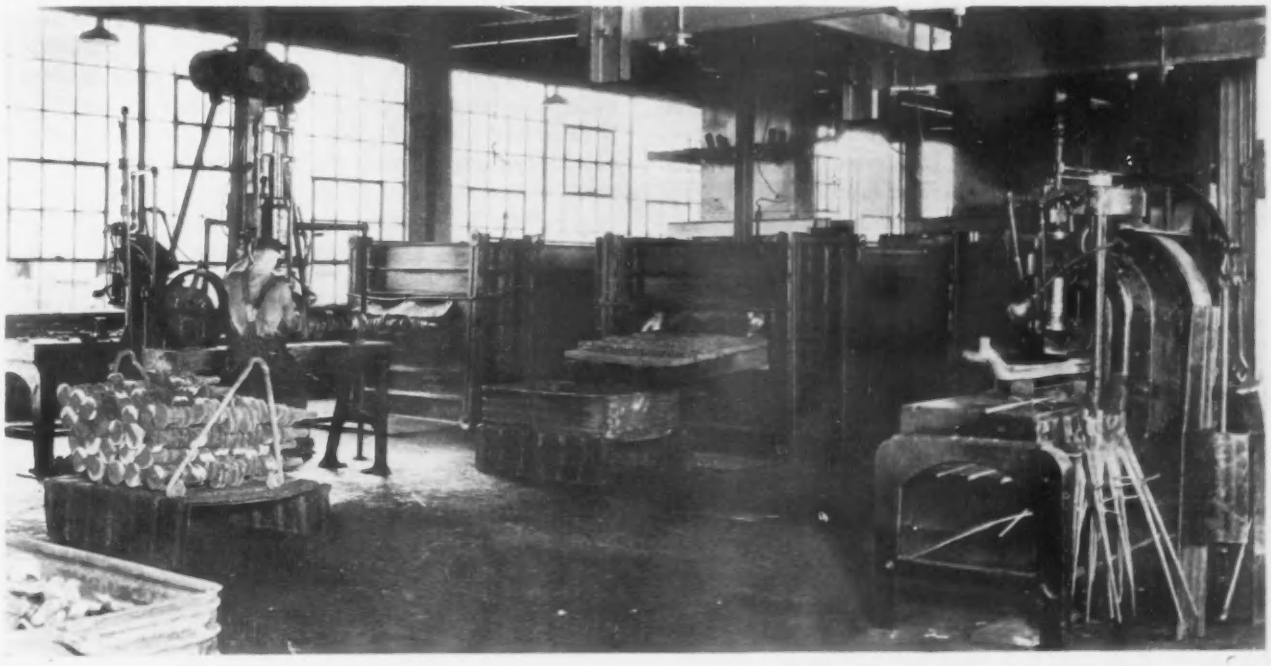


center of the plant convenient to all manufacturing divisions.

In the steam forge shop the large hammers, including a 16,000-lb. hammer, are served by tracks and trolleys as well as cranes, which span the entire width of the building, traveling the length of the shop and the steel storage yard. All large hammers have continuous heating furnaces, some of which have been designed by the company.

It is worthy of note that steel from the storage yard is fed into the steam forge shop from one end and the dies from the opposite end, the straight-line production of forgings beginning at this point. In the board hammer shop the company has been replacing small steam hammers with the latest type of motor-driven board hammers, the first battery consisting of two 2000-lb. and four 2500-lb. board hammers. Presses are motor-driven and arranged so that they can be moved to suit the jobs going through the shop, whether they are to be cold-trimmed after forging or hot-trimmed at the hammer.

*(Concluded on page 1726)*



# METAL LUBRICATION AND ROLL COOLING IN ALUMINUM

By DR. ROBERT J. ANDERSON
Consulting metallurgical engineer
Cleveland

IN the hot break-down operation on aluminum and aluminum-alloy sheet ingots, proper provision must be made for lubricating the surfaces of the ingots and for cooling the rolls. Lubrication and cooling are requisite and essential to the process. Lubrication of the ingot surface is necessary to prevent the slabs from sticking to the rolls, to increase the tendency of the rolls to bite, and to prevent the slabs from curling. Cooling of the rolls is necessary to permit continuity of operation, increase the life of the rolls, and reduce the consumption of lubricant.

Most oils and greases are effective in preventing aluminum slabs from sticking to the rolls. If the tendency to stick is prevented or lessened, the tendency toward curling is likewise diminished. Curling is, of course, undesirable since slabs coming off the mill in a curled condition must be flattened prior to further processing. Oils, however, are not effective coolants in comparison with water, because of their relatively low specific heats. The specific heat of ordinary lubricating oil is about half that of water. As a practical matter, oils may be omitted from consideration as roll coolants in aluminum hot-mill practice. Water is the least expensive and most efficient medium for reducing the temperature of the rolls.

Methods employed in practice for lubricating and cooling vary considerably in different rolling mills. In tonnage plants, however, it is desirable that the two desiderata be combined and continuous. An effective method of continuously cooling and lubricating consists in spraying the roll surfaces with a water emulsion of a so-called soluble oil. Thus, water is provided to serve as the coolant and oil as the lubricant.

### Roll Temperatures and Their Effects

An aluminum hot mill is not hot in the sense that the rolls are heated, other than by contact with the ingots. Aluminum and aluminum-alloy ingots are heated to some elevated temperature for breaking down into slabs on the hot mill. If ingots at about 450 deg. C. are passed on a cold mill, using an oil lubricant on the metal, the rolls heat and presently become so hot that the lubricant flashes.

The rate at which the rolls increase in temperature depends on the temperature of the ingots, the mass of the ingots and area contracting the rolls per pass, the mass of the rolls, the volume and nature of the lubricant, number of ingots rolled per unit of time, and other factors. On each pass, those portions of the roll surfaces which contact the surface of the hot ingot or slab are heated to a temperature about half the difference in temperature between that of the ingot and the rolls. (*a*)

Thus, the rolls increase in temperature on continued passing and presently, with the lighter lubricants, a sheet of flame breaks out when the ingot is hit. This is not only dangerous to the mill operators but also substantially destroys the lubricating value of the oil, causes charring on the slab and, still more, raises the temperature of the rolls. Also, as the rolls heat, the tendency of the slabs to stick and curl is greatly increased. The net result is that, sooner or later, the break-down operation must be stopped in order to cool the rolls. This, of course, decreases the output of the mill and increases costs.

Aside from sticking and curling of the slabs, troubles with the lubricant, and reduced rate of output, a high roll temperature has a very deleterious effect on roll life, particularly in the case of chilled cast iron rolls. That is to say, repeated heating to a high temperature followed by cooling has a much more harmful effect than repeated heating to a considerably lower temperature followed by cooling. Repeated heating and cooling are undesirable in the case of chilled cast iron rolls because of the thermal fatigue induced by the differential expansions of the internal gray iron mass and the white iron face rim. The stresses set up by the repeated heating and cooling presently lead to cracking of the roll surfaces and ultimately to breakage.

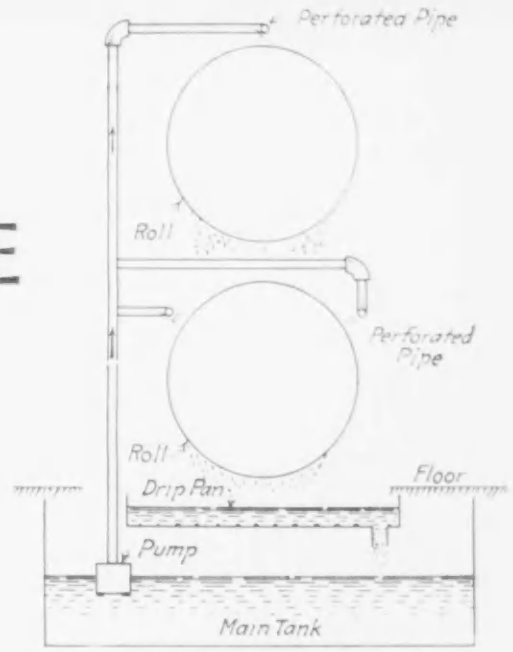
The condition of checking and irregular surface fissuring formed on the surfaces of chilled cast iron rolls is referred to as "fire-cracking." A fire-cracked roll is undesirable, first, because it imparts its crack pattern to the surface of the aluminum slab, and second, because it has started to fail and consequently may break in the mill housings, thereby causing damage. Fire-crack impressions on a slab may persist to a greater or lesser degree throughout the subsequent

(a) W. Trinks, "Use of Water on Rolls to Improve Operation of Mills," *Iron and Steel World*, Vol. 1, March, 1927, pages 131 to 133.

# HOT-MILL PRACTICE

**SEVERAL problems are encountered in rolling aluminum and aluminum-alloy sheet ingots. A major one is proper lubrication and cooling—to prevent the metal from sticking to the rolls, to lessen the tendency of the sheets to curl and to increase the life of the rolls.**

**Several lubricants are used, such as kerosene, light machine oil, greases, and water-oil mixtures. The relative value of these and the practice of some American and European plants are here discussed.**




Scheme for handling lubricating coolant at hot mill.

cold rolling. When the hot-mill rolls are badly fire-cracked, it may be advisable to roll the slabs thicker than usual, thus allowing extra stock so that the impressions may be worked out. Fire-cracking can evidently not be prevented in chilled cast iron rolls but its onset may be substantially deferred by proper cooling. Alloy cast iron rolls apparently tend to fire-crack less readily than ordinary cast iron rolls, and forged steel rolls crack less readily than either.

Regardless of the cracking tendency of roll faces, cooling is necessary to prevent sticking of the slabs. When a slab sticks, it may ride around on the roll and cause damage to the feed tables or injury to an operator. Stickers cause local overheating of the rolls and hence promote fire-cracking and breakage.

If rolls are not cooled, they ultimately would attain approximately the temperature of the hot ingots, provided that rolling could be carried on for a sufficient period of time. On the other hand, if rolls are continually cooled with a water-oil emulsion, the temperature is maintained at about 100 deg. C. Of course, those portions of the faces which contact the ingot or slab on the pass are momentarily raised to considerably higher temperature, say to about 275 deg. C.

Sundry lubricants have been employed in practice for preventing aluminum slabs from sticking to the rolls. These include kerosene, light machine oil, transformer oil, cup grease, and water-oil mixtures. Lubricants are applied to the rolls or the ingots, or both, depending on circumstances. In any case, the lubrication should not be too generous or, more precisely stated, the lubricant should not be too oily (slippery), since this leads to trouble in the rolling. Thus, if the lubricant is too slippery, it is bothersome to start the ingot into the roll opening and, even after the rolls have bitten, the ingot may suddenly turn at right angles or cater-corner and roll through in the wrong direction. (Guides are not used in the hot breakdown operation on aluminum sheet ingots.) This behavior may be experienced with very oily lubricants or with so-called solutions when the water-oil ratio is not right. Suitable tests may be applied to measure the oiliness of lubricants. The lubricating value of a substance is, of course, determined by its film-forming capacity.

Lubricating oils may be conveniently applied to rolls and ingots by blowing as a mist from a spray gun, but they are often thrown on by hand dipper. Heavy greases may be rubbed on the ingots with a swab. Water-oil emulsions are usually delivered under pressure to the roll surfaces by means of perforated pipes. Even or regular lubrication is desirable.

### Coatings May Form on the Rolls

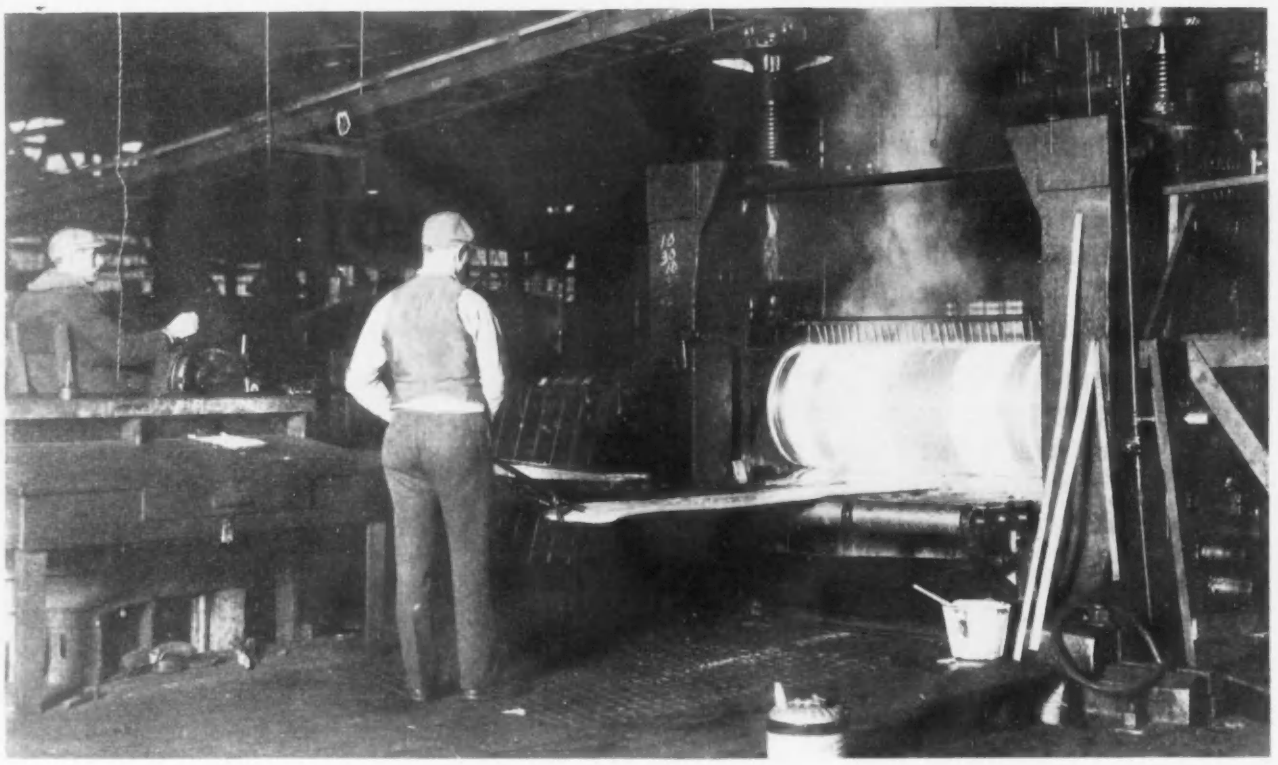
When aluminum is rolled on a mill without buffs or without the use of a cutting metal oil, a coating forms on the rolls. This coating consists of fine flakes of aluminum—more or less oxidized—which have been exfoliated from the metal and ground into the surfaces of the rolls. Coating formation on hot-mill rolls is governed, among other factors, by the composition of the material rolled (whether aluminum or some alloy) and by the nature of the lubricant used. Lubricants in general tend to remove the coating, oils and greases preventing its formation or cutting the coat more quickly than kerosene.

Opinion differs as to the desirability, function, and maintenance of a coating on hot-mill rolls. A dirty or too heavy coating should be avoided or rather removed by dressing when formed. One effect of the coating is to roughen slightly the roll surfaces, thereby inhibiting slipping on the pass. It also possibly has some effect as a heat insulator, due to the presence of aluminum oxide, and hence tends to prevent flow of heat from the ingot to the rolls. In the production of bright, flat aluminum sheet, the finished material may exhibit a blotched appearance if rolled from slabs taken off a hot mill with a smutty coating on the rolls.

### Lubrication and Cooling Should Be Combined and Continuous

In some mills, the hot-mill lubricant is varied, depending upon the class of finished sheets to be produced. Thus, slabs for the production of gray plate or coil may be rolled with a water-oil emulsion, and slabs to be rolled into bright, flat sheet and other highly finished material may be broken down with kerosene or some oil as the lubricant. Water-oil mixtures may tend to leave a milky white film on the slab surfaces. This residue may persist throughout the subsequent processing in rolling bright, flat sheet. In rolling coil, however, such film would be removed by the cutting oil. In the case of gray plate, it might be of no consequence, being obscured by the semi-matte finish of this class of sheet. Slabs rolled with kerosene or machine oil as the lubricant are considerably brighter as they leave the hot mill than when rolled with water-oil emulsions.

As mentioned above, it is desirable that lubrication and cooling be combined and continuous. So far, the ideal combined lubricant and coolant has not been developed, but the medium which most closely fulfills requirements is a water emulsion of a "soluble" oil. Hot-mill "solutions" are made up by mixing a definite small percentage of a sulphonated oil with water. Such solutions have a creamy appearance. Water-oil emulsions are very effective cooling agents, due to the high specific heat of water. Similar solutions are used in machine tooling. Some soluble oils, although satisfactory in other respects, are not suitable for use in aluminum hot-mill solutions because of the very considerable film formed on the slabs. Hence, selection of the proper type of oil is important. Soluble oils are sold under various trade names.



Showing application of water-oil mixture to the rolls of a two-high reversing hot mill.

### Practice at Some Plants

At one plant, kerosene is used as the lubricant. Before starting the first pass, the hot roller sprays the rolls with kerosene from a spray gun. Ingots are rolled one after the other for about 25 to 30 min. when the operation is stopped and the rolls are cooled with a water-spray for about 15 min. The water is delivered from a perforated pipe mounted between the housings and above the upper roll; the rolls are revolved as the water is sprayed. After cooling, rolling is resumed as before. As is apparent, with this practice slabs are being produced during about 65 per cent of the working time.

It is often said that the use of kerosene as the lubricant promotes fire-cracking of rolls. Obviously, the rolls fire-crack because they are repeatedly overheated and drastically cooled by water, the kerosene having virtually no cooling effect. If the slabs tend

to curl when kerosene is used, a little cup grease may be swabbed on the surface; on the next pass, the slab will likely flatten.

At a plant in Continental Europe, the ingot surface is rubbed with a chunk of bacon tied to a stick, and a small amount of crude oil is thrown on the rolls from time to time. At another foreign plant, lubrication is with light machine oil, thrown on the rolls by hand dipper.

At one plant, lubrication and cooling are combined by spraying a mixture of 5 per cent soluble oil with water on the rolls continually. The solution is fed to both rolls by means of perforated pipes, and the volume delivered is ample to keep both rolls covered with an appreciable layer. In another mill, a more dilute oil-water mixture is fed continuously to the rolls, and a little kerosene is thrown on by dipper from time to time. It is general practice in various mills to throw on a small quantity of kerosene to improve the bite or prevent slipping on the pass. In the use of water-oil mixtures, the solution flowing off the rolls runs into a catch-basin or tank beneath the mill and is re-circulated.

The application of combination lubricating coolants has come with the development of tonnage operations in aluminum sheet mills, where it is out of the question to waste time in stopping the break-down operation to cool the rolls. Water cooling is decried by some foreign mill men on the basis that it tends to promote staining and blotching of the finished sheets. Oil-water emulsions are also not regarded favorably by some operators.

### Application of a Lubricating-Cooling System

One illustration shows the schematic lay-out of pipes and tank for handling the lubricating coolant at the aluminum hot mill. The tank for holding the bulk of the coolant is placed in the mill pit, and the solution is continually pumped to the perforated pipes while the mill is in operation. Two delivery pipes may be arranged for the upper roll, if desired. A catch-basin (drip-pan) is situated beneath the lower roll to receive the run-off, this latter flowing into the tank through a down-spout. The orifice of the spout is covered with a screen to prevent foreign matter from being carried into the tank. Dirt, grease from the rollnecks, gloves, tongs, etc., that might fall into the main tank are caught by the drip pan.

As an alternative, the solution may be pumped from the main tank to a small supply tank, situated above the mill, instead of directly to the perforated pipes. With this alternative arrangement, delivery is made to the perforated pipes by gravity. The take-off for the pump line from the main tank and the exit pipe from the secondary tank should be at levels somewhat above the bottoms of the respective tanks so as to avoid drawing sludge into the lines. Screens may be provided at suitable places in the system to obstruct the passage of foreign matter. These screens should be cleaned at periodic intervals. Connection between the main supply lines and the horizontal perforated pipes, which deliver to the rolls, may be made with rubber hose. Another illustration shows a two-high reversing hot mill in operation. The streams of solution flowing from the perforated pipe over the upper roll may be noted.

When a lubricating coolant, continuously applied, is used, the total available volume should be amply large to prevent excessive heating and evaporation. Thus, the capacity of the main tank for handling the supply to an 84-in. mill should be about 2500 to 5000 gallons. The tank may be placed in the pit beneath the rolls; if the pit is not sufficiently large, one tank may be placed in the roll pit and another in the counter-balance pit, the first overflowing into the second. If the total available supply of solution is too small, say 500 gallons, it heats very rapidly and does not yield the desired cooling results.

Also, when hot solution is sprayed on the rolls, the consumption of coolant is markedly increased and the roll coating becomes too heavy. If the available supply is only 250 to 500 gallons, it may be necessary to renew the entire supply daily. On the other hand, when the supply totals 2500 to 5000 gallons, it may be necessary to prepare a fresh quantity only once a month or once in two months. The oil content of the solution, or rather the oil-water ratio, should be maintained by proper fresh additions as required.

When oil-water emulsions are sprayed on the rolls, there is more or less splashing, as well as run-off from the slabs, on the floor on both sides of the mill. With wood, steel, or concrete floors, the floor surfaces become very slippery. Good footing for the roller and catchers may be provided by laying large, loosely woven rush mats on either side of the mill. Suitable hood may be provided above the mill to carry off the steam, thereby preventing moisture from being introduced into the mill atmosphere. Appurtenances of the mill proper should be painted or greased to prevent corrosion by the solution or steam.

In a subsequent article, metal lubricants used in cold-rolling aluminum sheet will be discussed.

▲▲▲

## Belt Drives with Iron and Paper Pulleys

INVESTIGATIONS into the tractive power of belt drives with cast iron pulleys and with paper pulleys have been made at Ohio State University, Columbus. A description of the work is covered in Engineering Experiment Bulletin No. 62, by C. A. Norman, professor, and G. N. Moffat, assistant professor. The paper gives data on transmission efficiency of various types of belts on the two types of pulleys. It goes thoroughly into the transmissive power of oak-tanned and rubber belts with such pulleys and with varying angles of contact. This latter is a matter of importance, in view of the present prevalence of short-center drives with large transmission ratios.

Among other things, it was found that the formulas commonly in use for the effect of contact angle on transmissive power are not dependable for all combinations of belts and pulleys. It was indicated by the experiments that, by judicious use of paper pulleys, the transmission power of both types of belts may be considerably improved.

# HEAT ABSORPTION BY REFRACTO OPERATION

AFTER the interior of a heating furnace has been brought up to operating temperature, the heat requirements per square foot commences to vary with the wall construction. This variation increases gradually until the furnace lining has become thoroughly saturated and the "steady state" or equilibrium condition has been reached. After this the true radiation for this condition depends entirely upon the thickness of firebrick and insulation.

After the furnace is hot we must, therefore, consider heat actually absorbed per square foot of interior area of the lining, and determine fuel requirements (heat liberation) by means of additional calculations of flue gas and miscellaneous losses during operation.

As was the case in Part I,* the foundation for this article is the data obtained from a large number of experimental tests in a special test furnace and in commercial installations. The procedure in all cases was to determine the temperature at different points through the thickness of various wall, arch and hearth constructions at fixed intervals of time throughout the cycle of furnace operation. From these values of temperature, the heat absorbed during each interval was calculated, and the resulting values plotted against elapsed time of operation.

This treatment of such experimental data has established comparatively simple relationships, by means of which both heat absorption and radiation during operation may be simultaneously determined by one calculation for a given set of operating conditions. This is in contrast with the usual method of separately calculating absorption and radiation from a series of assumptions concerning the percentage of heat saturation in the lining.

A tentative outline of the simultaneous method of calculating absorption and radiation was presented in the author's book, "Practical Industrial Furnace Design." Data in this article are designed to improve the approximations necessary at that time. A brief review of the theory of heat flow is important at this point, and a graphical idea is given by Fig. 3. The flow of heat in the range of heating up was discussed in Part I, and attention is directed again to the fact that the curves for all wall thicknesses are practically

*The first part appeared Dec. 17, page 1556.

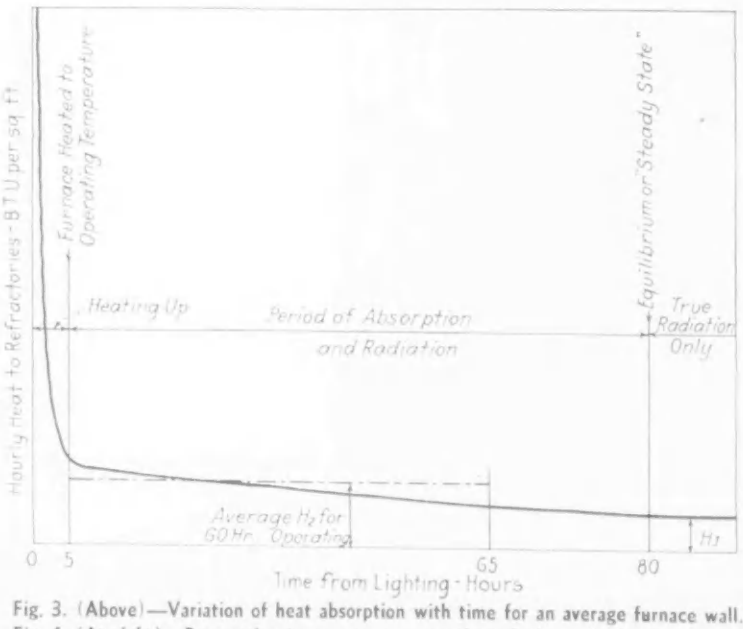



Fig. 3. (Above)—Variation of heat absorption with time for an average furnace wall.

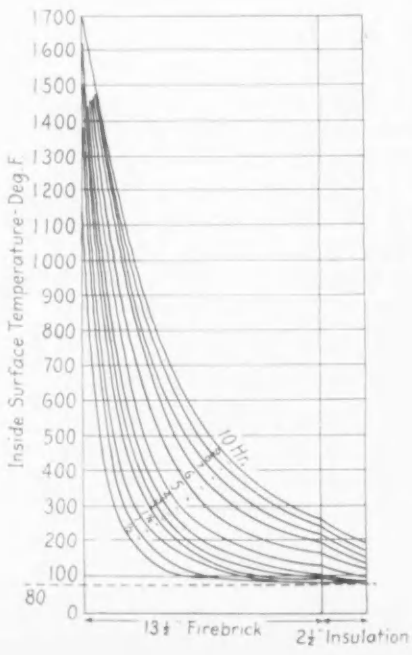



Fig. 4. (At right)—Progressive temperature curves through the wall of a direct-fired furnace heated in 10 hr. to 1700 deg. F.

# RIES DURING

# OF FUEL-FIRED FURNACES

By M. H. MAWHINNEY,
Electric Furnace Co.,
Salem, Ohio

IN Part I of this series of two articles on heating the refractory lining of industrial furnaces a relationship was established between the time required and the rate of heat liberation in the furnace, when heating it up to operating temperature. Such a relationship, as given in Fig. 1 of Part I, showing the necessary heat liberated hourly per square foot of interior furnace area, to heat the furnace in a given time, makes it simple to calculate the fuel requirement for this phase of furnace heating.

Heat requirements during operation after the furnace is hot, make a different problem. As was shown in Part I, the fuel requirements during heating to temperature are practically independent of wall construction. After the furnace interior has become hot, however, the heat requirement varies with the wall construction until a point of equilibrium is reached, beyond which true radiation prevails.

identical in this range. The lining is still absorbing heat, and the radiation from the outside is low when actual operation of the furnace commences.

From this point the radiation gradually increases and the absorption decreases until equilibrium is reached, when the lining is saturated and the heat entering the wall is exactly equal to that radiated. The numerical value of this radiation, $H_1$ in Fig. 3, for steady state or equilibrium condition is well known for different thicknesses of firebrick and insulation. All that is necessary to calculate absorption and radiation in one operation is to use the average value $H_1$ in the range of time in which the furnace is operated and for the proper wall construction.

Determination of values of $H_2$ is the purpose of this article. In the course of such determination the effect of the following factors must be considered:

1. Furnace temperature during operation.
2. Thickness of firebrick and insulation.
3. Rate of heat liberation.
4. Time and cycle of operation.

The experimental test furnace described in Part I was used for a part of the tests, of which typical examples are outlined in detail in what follows:

### *Examples of Individual Furnace Heats*

THESE examples correspond to any case in actual practice where a cold furnace and charge are to be heated and soaked for a known time, or where the furnace has been heated empty from cold and material is to be heated continuously for a known length of time. The problem is to determine the heat required by the refractory lining.

Our experimental furnace is 6 ft. wide, 5 ft. deep and 3 ft. 2 in. high, fired from one side. A wall constructed of 13½ in. of firebrick and 2½ in. of insulation was selected for temperature measurements. Fig. 4 shows the progressive temperature curves through the wall in test No. 4 of Fig. 5.

For each of the curves in Fig. 4, the average temperatures of firebrick and of insulation were found. For example, the average temperatures after 2 hr. were 350 deg. F. for the firebrick and 90 deg. F. for the insulation. After 3 hr. these temperatures became 384 and 95 deg. F. The heat gained hourly by each square foot of the firebrick was

157 lb. of brick x 0.25 specific heat
x (384 — 350 deg. F.) = 1330 B.t.u.

This represents the absorption for the average elapsed time of 2½ hr. Similarly, the heat gained by the insulation is 22 B.t.u. per sq. ft. hourly, so that the total hourly absorption is 1352 B.t.u. per sq. ft. The radiation from the outside of the wall can be neglected for this calculation, but must be added as the outside temperature increases.

By repeating this calculation for each curve representing a set of temperature readings, the curves of Fig. 5 were prepared. These curves show the absorption for four characteristic tests selected as most typical of a group of tests, all of which showed consistent agreement.

Test No. 4 consisted in heating up the direct-fired

furnace to 1700 deg. F. and holding it at that temperature. Test No. 6 was similar, but with 1300 deg. F. temperature and with the furnace bottom altered to form a combustion space for underfiring, instead of direct firing from the top of one side wall. Test No. 13 was heating up to 1000 deg. F., with the furnace again fired from one side direct and the solid bottom restored. Test No. 26 is again direct fired, and the furnace is heated up at an unusually high rate of heat liberation to 1600 deg. F. All temperatures represent the average from six thermocouples distributed in the furnace heating chamber.

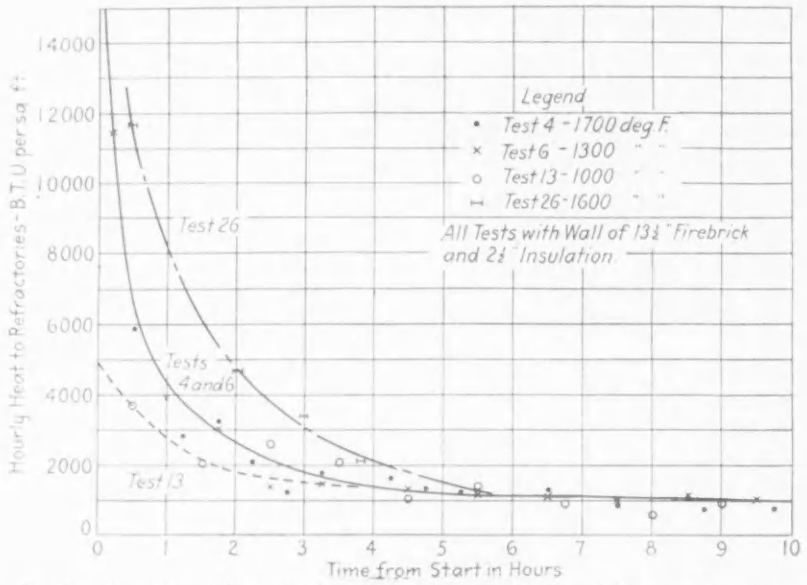



Fig. 5.—Absorption of furnace refractories under various rates of heating and various final temperatures.

It will be noted from Fig. 5 that the curves for the 1700-deg. F. and the 1300-deg. F. tests are almost identical in this range. This is explained by the fact that the rates of heat liberation were not greatly different in these tests. The effect of an exceptionally high rate of heat liberation is shown by the curve for test No. 26. In the 1000 deg. F. test the rate of heat liberation was about half that for the two average tests, and the rate of heat absorption is lower in the first few hours.

To afford an idea of the ratio between heat liberation and heat absorption, particularly in comparison with the data given in Part I, the two average rates were calculated (absorption from Fig. 5 and liberation from measured fuel consumption) for the period of time actually spent in heating up for these tests. These data are shown in Table VI.

Let us consider now the practical application of the data of Fig. 5 and other similar tests to furnace calculations. The most simple method of calculating the heat given to refractories is to start in all cases with the true radiation value corresponding with equilibrium, or saturated conditions, for the particular wall, roof or bottom construction under consideration. Practical values for true radiation from various walls are given in Table VII.

We have seen in Part I that the heat absorption in furnace linings is practically independent of the wall construction for the time required to heat up, after which radiation becomes more important in comparison with absorption, and the values diverge until the refractories are saturated. Then the fixed values of Table VII pertain for different brick thicknesses.

Regardless of wall construction and final temperature, and for usual rate of firing, tests indicate that, when a furnace lining has reached the desired operating temperature, the rate of heat absorption by the interior (total of absorption and radiation) is usually about 1200 B.t.u. hourly per square foot (as for an elapsed time of 5 to 6 hr. on Fig. 5), and that, from that point, the curve approaches a straight line. By taking advantage of these facts and the known values of Table VII, we can calculate the drop hourly in the rate of absorption, if we know the time required to reach equilibrium.

Careful tests on the time actually needed to reach equilibrium show the following results for three different lining constructions:

9 in. firebrick and no insulation, 30 hr.
9 in. firebrick and 5 in. insulation, 50 hr.
13½ in. firebrick and 2½ in. insulation, 60 hr.

Considering the example of Test No. 4 in Fig. 5, and assuming a time of 60 hr. to reach equilibrium for the wall, (13½ in. firebrick and 2½ in. insulation), the hourly rate of absorption and radiation when the furnace is ready to operate (6 hr.) is 1200 B.t.u. per square foot, and the true radiation hourly for 1700 deg. F. at

**Table VII—*True Radiation from Various Walls at Differing Temperatures, B.t.u.**

| Firebrick, Inches | Insulation, Inches | Furnace Temperature, Deg. F. 1,000 | 1,200 | 1,400 | 1,600 | 1,800 | 2,000 | 2,200 |
|---|---|---|---|---|---|---|---|---|
| 4½ | 0 | 1,050 | 1,250 | 1,480 | 1,860 | 2,130 | | |
| | 2½ | 450 | 510 | 600 | 720 | 850 | 1,005 | |
| | 5 | 216 | 300 | 375 | 450 | 530 | 610 | |
| | 7½ | 178 | 215 | 265 | 315 | 362 | 410 | |
| | 10 | 150 | 185 | 220 | 260 | 295 | 330 | |
| | 12½ | 140 | 165 | 190 | 220 | 250 | 280 | |
| 9 | 0 | 550 | 700 | 860 | 1,040 | 1,220 | 1,400 | 1,600 |
| | 2½ | 310 | 380 | 460 | 560 | 660 | 762 | 865 |
| | 5 | 204 | 244 | 269 | 339 | 364 | 429 | 490 |
| | 7½ | 170 | 200 | 232 | 266 | 300 | 334 | 370 |
| | 10 | 140 | 170 | 199 | 226 | 253 | 281 | 310 |
| | 12½ | 125 | 150 | 170 | 190 | 212 | 235 | 260 |
| 13½ | 0 | 405 | 500 | 590 | 700 | 830 | 975 | 1,120 |
| | 2½ | 230 | 300 | 380 | 455 | 535 | 615 | 705 |
| | 5 | 166 | 204 | 244 | 259 | 314 | 349 | 396 |
| | 7½ | 150 | 175 | 200 | 226 | 255 | 285 | 320 |
| | 10 | 128 | 150 | 176 | 200 | 228 | 254 | 280 |
| 18 | 0 | 264 | 365 | 460 | 560 | 660 | 760 | 865 |
| | 2½ | 180 | 239 | 267 | 319 | 367 | 455 | 515 |
| | 5 | 149 | 181 | 215 | 247 | 280 | 311 | 349 |
| | 10 | 127 | 148 | 170 | 194 | 220 | 240 | 270 |

*From "Practical Industrial Furnace Design"—Mawhinney, John Wiley & Sons, New York.

60 hr. is 500 B.t.u. per square foot, from Table VII. The hourly drop per square foot is then

$$\frac{1200 - 500}{54 \text{ hr. operating}} = 13 \text{ B.t.u.}$$

If it is then desired to find the average heat supplied hourly to the refractories per square foot, for an operating interval of 10 hr. after the furnace is hot, the value will be

1200 — (5 hr. x 13 B.t.u. hourly drop) = 1135 B.t.u.

The factor for multiplication of the proper value of Table VII in this case is therefore $\frac{1135}{500} = 2.3$.

During a period of 40 hr. after heating up, the average heat hourly to the refractories would be 1200 — (20 hr. x 13) = 940 B.t.u. per sq. ft. and the factor would be $\frac{940}{500} = 1.9$.

Table VIII has been prepared to show these factors for different intervals of time after the furnace is hot and for different lining constructions.

As an example of the use of the above data, take an oil-fired furnace 20 ft. long, 6 ft. wide and 4 ft. high. It is to be heated to 1500 deg. F. in 5 hr. and operated at that temperature for 20 hr. How much oil will be required for the refractories?

From Fig. 1, Part I, the hourly rate of liberation required to heat the furnace in 5 hr. is 5900 B.t.u. per square foot. As the total inside area is 448 square feet, the oil required to heat up is

$$\frac{5900 \times 448 \times 5 \text{ hr.}}{140{,}000 \text{ B.t.u. per gal.}} = 95 \text{ gal. oil.}$$

Assume the furnace is constructed as follows:

Roof ..... 9 in. firebrick and 5 in. insulation
Walls ..... 13½ in. " " 5 in. "
Bottom .... 18 in. " " no "

Then—

| | | B.t.u. An Hour |
|---|---|---|
| Roof | —120 sq. ft. x 304 (Table VII) x 3.0 (Table VIII) | = 110,000 |
| Walls | —208 sq. ft. x 252 (Table VII) x 4.0 (Table VIII) | = 210,000 |
| Bottom | —120 sq. ft. x 510 (Table VII) x 1.9 (Table VIII) | = 116,000 |
| | | 436,000 |

**Table VI—Ratio Between Heat Liberation and Heat Absorption**

| | Test No. 4 | Test No. 6 | Test No. 13 | Test No. 26 |
|---|---|---|---|---|
| Time to heat up, hours | 6 | 5 | 5½ | 3½ |
| Average hourly rate of heat liberation, B.t.u. per sq. ft | 6,200 | 5,900 | 2,675 | 8,000 |
| Average hourly rate of heat absorption, B.t.u. per sq. ft., from Fig. 5 | 4,180 | 4,730 | 2,475 | 7,300 |
| Ratio $\frac{\text{liberation}}{\text{absorption}}$ | 1.48 | 1.26 | 1.08 | 1.10 |

If the gases leave the furnace at 1600 deg. F., the proportion of their heat available in the furnace for useful work is 63 per cent. Hence the fuel required is

$$\frac{436{,}000 \text{ B.t.u.}}{0.63 \times 140{,}000 \text{ B.t.u. per gal.}} = 4.95 \text{ gal. oil an hour}$$

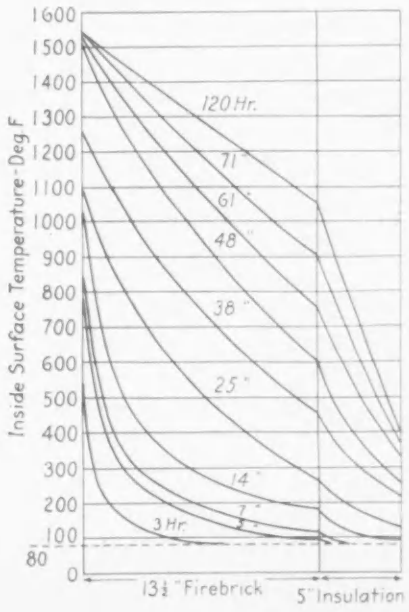
and the total oil is

| | |
|---|---|
| Operating, 20 hr. x 4.95 | = 99 gal. |
| Plus, for heating up | = 95 gal. |
| Total oil | 194 gal. |

## *Examples of Long-Time Tests*

IN contrast with the foregoing examples of furnaces which are heated from cold (Monday morning after week-end shut down, or occasional heat with days intervening), are furnaces which are brought to temperature and held there for comparatively long periods of time. This time may vary from a full week of continuous operation (130 hr.), as in continuous mill and heat-treating equipment, to 12 months (8760 hr.) or more, as for continuous ceramic kilns. The heat flow in such cases may be calculated from data already presented in this article, but it is interesting to see the details of the heat flow for a typical example.

Fig. 6 shows the lines of temperature distribution for a wall constructed of 13½ in. of firebrick and 5 in. of insulation in a continuous carburizing furnace which was slowly dried out after construction. Temperature values were obtained by periodic reading of thermocouples buried in the furnace wall at different



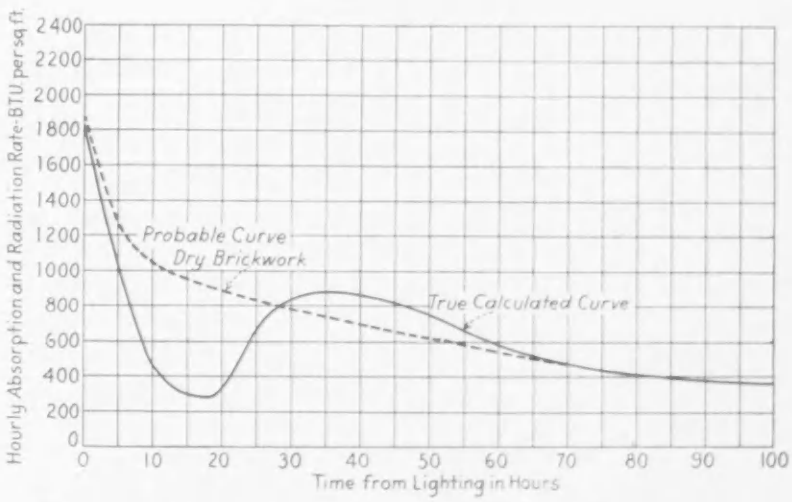




Fig. 6. (At left)—Temperature distribution through the wall of a continuous carburizing furnace which was slowly dried out after construction.

Fig. 7. (Above)—Drying curve for continuous carburizing furnace, showing effect of driving off moisture from the brickwork during the first 30 hr.

depths. The initial rate of heating was quite slow, to drive off carefully the moisture in the fireclay.

By methods already explained, of calculating successive heat contents of the wall with known intervals between curves, the rate of heat absorption was calculated. This is shown in Fig. 7 as a function of average time elapsed from lighting. The true curve of Fig. 7 represents the actual variation in absorption rate with time, and the effect of the heat required to drive off the water vapor is clearly shown by the drop in the apparent rate of absorption, as measured by brick temperatures, during the first 30 hr. or so after lighting.

The probable curve if the brickwork had been dry is shown also in Fig. 7, taking into account the comparatively low rate of heat liberation in the furnace when drying out. In this test no further change in brick temperatures was found, after 120 hr. of very slow heating had elapsed from time of lighting. After 120 hr. the rate of heat flow is in the equilibrium state with no heat absorption. With normal rate of heating, this time would be about 70 hr. From Table VII the true radiation for a wall of 13½ in. firebrick and 5 in. insulation is 286 B.t.u. per square foot hourly, and the agreement of the test figures with this value can be seen from Fig. 7.

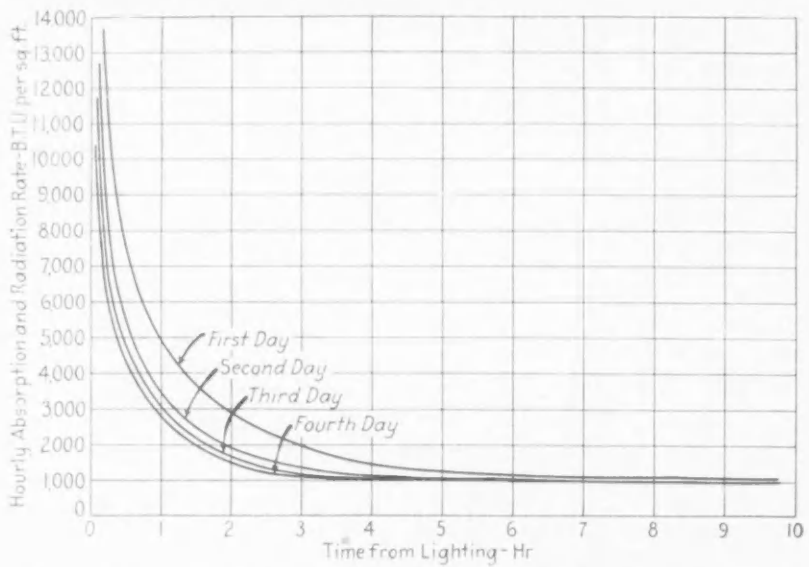



**Fig. 8.—Furnace used day after day, and allowed to cool during the night, requires less heat successively for several days; as the period increases, the heat requirement becomes uniform.**

### *Examples of Repeated Heating Cycles*

A THIRD common method of furnace operation is to heat the furnace for only 10 hr. a day, but to operate consistently for 5 or 6 days a week. It is obvious that the furnace will not cool off entirely over night, and that therefore the rate of heat absorption will be less in the latter part of the week than it is for the first day. To duplicate this condition, a series of tests was arranged for the test furnace, in which a cycle of 10 hr. heating was followed each day, starting at the same time each morning, and operating at the same temperature of 1600 deg. F.

In these tests temperatures in the brickwork were periodically observed, and the rate of heat absorption was determined in exactly the same manner as for former tests. Results of these calculations, given in Fig. 8, show the variation in rate of absorption with elapsed time. One will observe a considerable decrease in heat absorption the second day as compared with the first day; a progressively lesser decrease the third and fourth days; and practically no change after the fourth day.

Since these measurements were made in a wall consisting of 13½ in. of firebrick and 2½ in. of insulation, the true radiation constant for equilibrium conditions is 455 B.t.u. per square foot hourly, Table VII.

Factors in Table IX, for comparison with true radiation, have no useful value or connection with Table VIII in this case, because the time used is from the instant of lighting, rather than from the time of reaching temperature, or (in case of the factors given in Table VIII) for a cold furnace at the start. In this case of repeated heating, the absorption rate must include the heating up of the furnace, since it is also a variable. And since the heating up must be included, the absorption will vary with the final temperature and the wall construction, and will not be in a constant relation to true radiation.

Unfortunately, the combination of 1600 deg. F. final temperature and a wall thickness of 13½ in. firebrick and 2½ in. insulation was the only one subject to test. But the results for this combination, as given in Table IX, will give a good idea of the general effect of repeated heating cycles.

**Table VIII—Factors, Total Heat Supplied, Divided by Radiation**

| Thickness—Inches | | Operating Period, Hours | | | |
|---|---|---|---|---|---|
| Firebrick | Insulation | 10 | 20 | 60 | 100 |
| 4½ | 0 | 1.0 | 1.0 | 1.0 | 1.0 |
| | 10 | 4.3 | 4.0 | 2.6 | 1.4 |
| 9 | 0 | 1.1 | 1.1 | 1.0 | 1.0 |
| | 5 | 3.3 | 3.0 | 2.0 | 1.5 |
| | 10 | 5.1 | 4.8 | 3.8 | 2.8 |
| 13½ | 0 | 1.6 | 1.5 | 1.1 | 1.0 |
| | 5 | 4.4 | 4.0 | 2.9 | 2.2 |
| | 10 | 5.7 | 5.4 | 4.2 | 3.1 |
| 18 | 0 | 2.0 | 1.9 | 1.5 | 1.1 |
| | 5 | 4.6 | 4.4 | 3.6 | 2.8 |

**Table IX—Varying Absorption with Intermittent but Regular Operation**

| | Absorption Hourly, B.t.u. per Sq. Ft. | Ratio to True Radiation |
|---|---|---|
| Average for first day | 2,660 | 5.8 |
| Average for second day | 2,180 | 4.8 |
| Average for third day | 2,029 | 4.5 |
| Average for fourth day | 1,900 | 4.2 |
| Average for fifth day | 1,900 | 4.2 |
| Average for week | 2,134 | 4.7 |

SUMMARIZED from the discussion in this article, the conclusions may be as follows:

1. In fuel-fired furnaces designed for intermittent

(*Concluded on page* 1708)

# GRINDING OF ROLLS FOR ROLLING MILLS

By H. J. WILLS
Engineer, Carborundum Co., Niagara Falls, N. Y.

IT is unfortunate that there are no standards of "surface" and "finish." In our experience in the roll-grinding field, we fail to find any two who agree as to what constitutes a good surface, as well as what finish should be applied to that surface when obtained. In fact, the two terms are invariably confused.

Rolls have been observed with a high luster which merely disguised a poor or unsatisfactory surface. On the other hand, some have a velvet or matte finish closely approaching surface perfection, and these were invariably obtained with a minimum of effort and expense, after which the application of the finish is relatively simple, though expensive.

Before finishing a roll, it is important that it be ground to a practically true circle, whether it be straight or cambered. If this is not done, the rolled stock will not be even in thickness.

### Proper Surface Avoids Reproducing a Pattern

Before considering the actual application of grinding wheels, it may be in order to discuss briefly the question of "surface." It is obvious that the desire is to produce a surface of such a degree of perfection that a "pattern" is not reproduced from the roll. This means simply that the roll must not have a pattern, and any existing grit marks must be extremely shallow. To obtain this surface condition, the surface must be built up, and few, if any, short cuts will accomplish the desired results. In this field of service a polish is no true indication of surface perfection.

It is argued by some that, without the existence of numerous flats on a curved surface, a polish is not possible. If this theory were sound, then a dull, smooth finish may be an indication of a good surface. We believe that, if such a surface were produced by careful building up, it is quite feasible to add a luster by lapping with loose abrasives or abrasive wheels of specialized characteristics, without creating flats.

In any case, it is of the greatest importance that the common faults of roll grinding, i.e., flats, chatter, grit and traverse marks, be not covered up by the mis-named lapping wheels. It is an inescapable fact that a good surface can be obtained only by a cutting action.

Any attempt to produce a high finish with wheels that have been dulled by dressing, or by changes of grinding operation, will result in burnishing. Burnishing consists largely of the laying over of high metal or ridges and produces a very pleasing appearance that generally lasts for a very short campaign, after which the pushed-over metal leaves the roll, exposing the original faults.

## *Characteristics of Rolls*

PROBABLY the greatest variable met in roll grinding is in the metallurgical characteristics of the rolls. As abrasive manufacturers, it is not our function to enter into a technical discussion of this phase of roll finishing. Nevertheless, metal variations should always be kept prominently in mind. Rolls, like personalities, are never identical. Hardness, tensile strength, ductility, alloy composition, etc., when varying from roll to roll, materially influence results obtained in grinding practice.

Rolls will vary somewhat in the making, due to molding conditions, such as pouring temperatures and conditions of molds. This is particularly so when several rolls are cast from the same ladle. Heat treating, too, is a source of possible variations and chilled iron rolls alter somewhat by aging, particularly after first cuts have been made.

## *Roll Grinding Machines*

IT is a generally accepted fact that roll grinders of different makes require wheels of widely dissimilar characteristics, even when used on rolls of similar specifications and requirements. Wheels, when selected, must be used to suit the grinding machine as well as the work.

Discussion of the merits of machine features, such as traversing tables vs. traveling heads, bearings, drives, camber attachments, etc., must be left to the machine builder. However, the roll shop must take these into consideration as having a major in-

THIS paper, covering the general subject of roll grinding and finishing in the sheet steel, strip mill, tin plate, steel plate and bar, sheet brass, copper and aluminum industries, is conceived in the spirit of an earnest desire to be of assistance to roll manufacturers and users, and further to advance the mechanics of roll grinding by presenting and discussing the many variables encountered. The theories, facts, and conditions forming the substance of the paper represent actual conditions found during a wide survey. Many elementary factors are constantly overlooked in practice, or ignored entirely. In many cases the entire matter of the practical end of roll grinding is left to the operators, many of whom are not expert grinders in the accepted sense of the word. There is a lack of a full understanding of the basic principles involved.

fluence in the selection of wheels, and on the quality of the work done.

The heart of the grinder is the wheel spindle, since it largely controls the chatter, work concentricity, burning, scoring and even the grit, grade and bond of the wheels. A reliable, high-quality ball or roller bearing, or a properly lapped sleeve bearing with the right oil and heat clearance, will permit soft gradings. Inversely, a wobbly or vibrating spindle requires harder gradings and generally, to prevent chipping and chatter, an organic bond, which, it should be understood, will not compensate for the spindle faults. A poor spindle condition with any wheel means poor grinding.

Direct-driven spindles, if connected to the motor through a coupling, require careful alinement. Too much dependence must not be placed on the coupling to take care of misalining. If the motor is integral with the spindle, a very careful balancing is essential. In this arrangement of integral mounting of the motor and spindle, stresses, causing side pull, are often the cause of hammering in the wheel, through vibration in the rotating elements.

Whipping of driving belts or chains and poor splices will cause vibration. Worn guideways, loose head and tail stocks, poor foundations, building vibration, weak neck-rests, lack of lubrication on necks, are well known causes of vibration but are frequently neglected.

Another factor, often neglected, is the proper heating up of the spindle bearings before grinding, especially for finishing cuts.

For extra-fine grinding, high-grade babbitt metal sleeve bearings are recommended, as they permit closer running fits when heated. Bronze bearings should be tightened down to a minimum for finish cuts on rolls requiring super-finishes.

### *Supporting the Work*

CHILLED iron and steel rolls are, in the majority of cases, of such size as to necessitate supporting their weight on their necks on neck-rests or stays. As these neck-rests are frequently of insufficient bearing surface, there is considerable tendency to heat the necks, which, especially in steel rolls, is very objectionable, inasmuch as it causes misalinement through unequal expansion, resulting in uneven grinding. Some machine builders advocate supporting the rolls on both necks and centers, particularly with the larger sizes.

Since the necks invariably wear eccentric to the centers, this combination support would necessitate frequent redressing of the necks. This, however, is strongly advocated in any case, as too often roll bodies are improperly ground because of eccentric necks. Cases have been observed where burns and oval roll bodies were traced to oval necks, and wheels are broken through heavy, intermittent pressures from this fault. We believe that, with few exceptions, rolls may be improved and their life increased by more frequent dressing of the necks.

Stays or neck-rests should be as long as the actual bearing surface of the necks, and no wider than one-one-hundredth of the neck circumference. In the case of two-point neck-rests, the front rest should be so angled that the roll would be forced positively by its own weight against the rear neck-rest, which should be set above the roll centerline to prevent climbing. Good lubrication of necks while grinding is absolutely essential, though often neglected, with attending serious results.

Rolls should be driven by at least two points, and care taken that each point has even pressure applied, to prevent any tendency to wobble the roll. Here is another good argument for the combination use of centers and neck-rests for support.

Work speeds could possibly be increased, to the general betterment of production and surface. Slow work speeds are objectionable for several reasons. It is a well known fact that it is impossible to grind a perfect cylinder, since cylindrical grinding unavoidably consists of numerous and small flat spots. It is quite obvious that, the faster the work travels, the longer these flat spots will be, and therefore proportionately shallower.

Then, too, since the work travels faster past any given point of the wheel, the grit marks are necessarily longer, and therefore less visible. However, it is always well to set the work speed at some point near, but under, safe maximum work speed, which is

limited by a point of vibration, and the tendency to heat.

**Coolants Require Careful Preparation**

Much has been said about the virtues of the various coolants, or grinding solutions, and many claims are made by manufacturers of compounds. But the entire matter is largely one of personal preference, partly controlled by the mineral properties of the available water supply. The following solution is offered as one of proved worth for all classes of work and wheels:

| | |
|---|---|
| Soluble oil | 3 gallons |
| Sal soda | 2 pounds |
| Water | 150 gallons |

Where water is inclined to be hard, the sal soda may be increased. Thick solutions permit softer wheel gradings. With such a compound are combined the advantages of clean wheel face, clean machine, cool cutting, rapid settling of dirt in the reservoir, and non-rusting properties. Finishing cuts, especially on cold rolls, should always be made with well-filtered coolants, even when clear water is used. Three or four thicknesses of cambric attached to the intake or nozzle are effective for finish cuts.

Reservoirs should be cleaned thoroughly at frequent intervals for all roll grinding, and always before finish cuts on so-called "super-finish" rolls.

## *Wheels for Roll Grinding*

A FEW general rules in the selection of wheels are worth considering. Naturally these are not positive, but if all variables are compensated for it will be found that every recommendation is reliable. All are predicated upon the idea that no one wheel can combine all the desirable features of ideal grinding practice.

A grinding wheel must operate in such a manner that immediately at the grinding face the stresses set up by the wheel rotation and work pressures are close to ultimate impact resistance of the bond and grain structure. A slight increase of pressure will break or dislodge the grains, while a slight decrease in pressure will permit dulling of crystals and glazing. In other words, any reduction in working stresses will cause the wheel to act "harder." Any increase in working stresses will cause the wheel to act "softer."

One point which should be emphasized here is that the grinding wheel which will give the best grinding action cannot be subjected to variation, in working stresses applied to it, without the sacrifice of either cutting action or abrasive material.

The relation of wheel speed to work speed will determine shearing force.

As wheel speed is increased in ratio to work speed, the stresses set up between work and wheel faces are lessened, and the wheel is not broken down so rapidly as under lower wheel speeds. As the work speed is increased in ratio to wheel speed, the stresses set up between the work and the wheel face are increased, and the wheel is broken down more rapidly. A proper ratio or balance must be arrived at between wheel speed and work speed for economical wheel operation.

Rate of traverse or cross-feed accounts for another shearing force acting on the wheel face, and is also a factor in the compressive force exerted on the whole or a portion of the wheel face.

Area of contact between work and wheel face is a factor affecting the compressive forces acting on the wheel face.

Physical properties (principally ductility, hardness and tensile strength) of the materials being ground are factors affecting the shearing force on the wheel face.

**Changes Constantly Going On**

In service the abrasive wheel is constantly diminishing in diameter; as a consequence, the relation of wheel speed to work is constantly changing. The reduction in diameter of the abrasive wheel also constantly operates to decrease the arc of contact between wheel and work.

As the abrasive wheel diminishes in diameter and the work speed remains constant the wheel will act "softer." And, if the grade strength has been properly balanced against the initial work and wheel speeds, the wheel will probably show excessive wear under the increased stresses imposed. This is true also when grinding smaller-diameter rolls.

Reduction of wheel diameter also decreases the area of contact and changes the character of the arc of contact, which in turn affects wheel action. The degree to which wheel action is affected will depend on the characteristics of the abrasive wheel used. Wheel and work speeds should be adjusted to compensate for the variation in stresses due to this reduction of wheel diameter.

(a) Rigid non-vibrating machine elements permit the selection of soft wheels, with a resultant increase in production.

(b) Any vibration will have a tendency to break the wheel down, necessitating tougher bonds, to compensate for the hammering action of the wheel on the work.

(c) Allowing for the above, large-diameter rolls permit softer bonds, owing to the greater area of contact between wheel and work. This applies also to wheels of wide faces, particularly those of greater width than 4 in.

(d) For chilled iron rolls, we recommend using Carborundum brand wheels, for roughing and finishing.

(e) For hardened steel rolls, we recommend using Aloxite brand wheels, for roughing and finishing, except as mentioned later.

(f) Finishing cuts may be improved with narrow wheels. To avoid changing wheels for each roll, it is practical to underdress the wheel face to a desired width. This, in effect, softens the wheel grading, which offsets the harder action of the lighter finishing cuts.

(g) It is suggested that the finest practical wheels be used for semi-finish and finish cuts, since

*(Concluded on page 1726)*

# A LOW ALLOY STEEL FOR LARGE-TONNAGE APPLICATIONS

By DR. A. B. KINZEL
Chief Metallurgist
Union Carbide and Carbon Research Laboratories, Inc.
Long Island City, N. Y.

THE name Cromansil has been chosen to cover a series of recently developed steels which have proved to be decidedly applicable in industry. As the name suggests the principal alloy constituents of the steels are chromium, manganese and silicon.

In the past much attention had been given to alloy steels for automotive purposes and engineering applications where comparatively small parts were involved and where the combination of heat treatment and alloy constituents resulted in a marked improvement in the physical properties of the material. However, until the end of the World War, very little work had been carried out on the alloy steels for large tonnage structural applications where in most cases heat treatment was out of the question.

About this time, however, the possibilities of alloy steels, either as rolled or simply heat treated by a single normalizing process, were recognized, and it is quite possible that in the years to come we may look back at this time with the realization that it opened up a new era in alloy steel practice and usage. Early in the century the so-called silicon steels and the high-nickel steels were finding limited use, and these two types constituted the sum total of structural steels at that period, always excepting the famous use of chromium steel in the Eads Bridge. Today we have a large tonnage not only of silicon and nickel steels but also of pearlitic manganese steels, the first to be developed in the present era.

### Standard Inexpensive Alloys Used

It was with the thought that a superior structural alloy steel could be developed by intensive research that a program to accomplish this was started at the Union Carbide and Carbon Research Laboratories. In any work where tonnage is involved the cost is of primary importance so that we were at once limited to alloy additions of moderate quantities and the use of alloys which in themselves were relatively inexpensive. Chromium, manganese and silicon, not only because of their marked effect in comparatively small quantities, but also because of their low initial cost, are preeminently fitted to fulfill this requirement. The effect of chromium as a strengthening agent has long been well known. The nature of manganese in lowering the critical point on moderate cooling rates has also been well established. Silicon is a prime deoxidizer and an alpha iron solid solution constituent. Likewise chromium steels, manganese steels and silicon steels are all of high re-

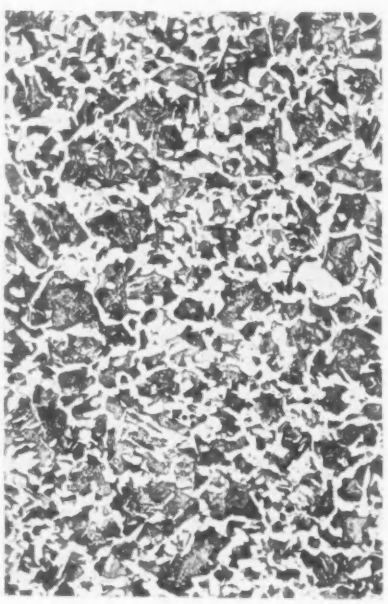


Fig. 1.—Photomicrograph of 0.21 per cent carbon Cromansil boiler plate, as rolled. 100 diameters.

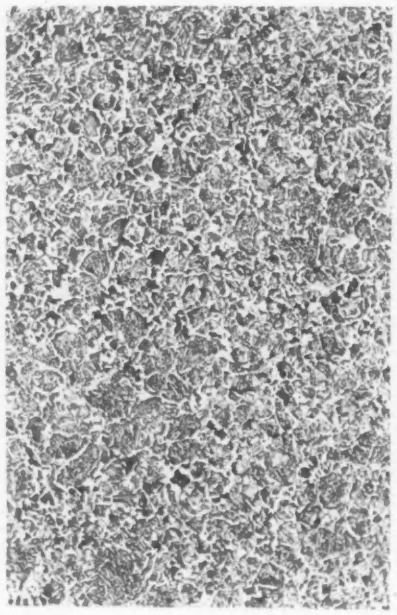


Fig. 2.—Photomicrograph of 0.21 per cent carbon Cromansil boiler plate, normalized. 100 diameters.

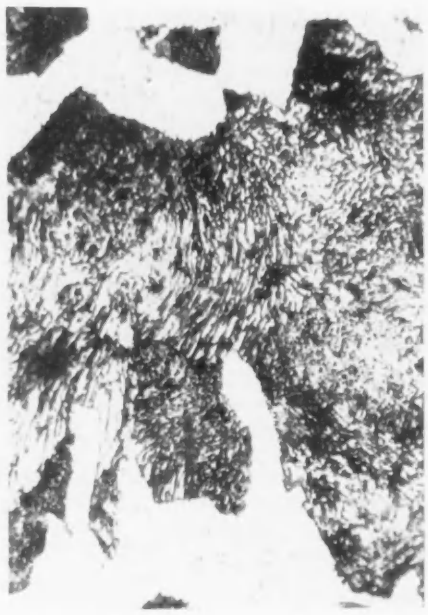


Fig. 3.—Fine pearlitic structure of Cromansil steel as rolled. 2000 diameters.

pute. Experimental work has shown that the combination of these elements resulted in physical properties which were more than additive in character.

At first this was difficult to understand but we have since come to the realization that the combination of chromium and silicon in the presence of manganese results in the formation of a complex silicide, the main constituents of which are chromium and silicon. This silicide has a differential solubility with temperature, and thus gives rise to the well known phenomenon of precipitation strengthening.

### Best Balance of Alloy Content

An intensive study involving a very great number of small heats of steel indicated that the best balance of alloy content is achieved by the following analysis range:

| | Per Cent |
|---|---|
| Chromium | 0.4 to 0.6 |
| Manganese | 1.1 to 1.4 |
| Silicon | 0.7 to 0.9 |

This, of course, may be varied for special applications but applies generally to structural work. In this steel there is an alloy concentration of approximately 2.50 per cent, involving alloys which sell for but a few cents per pound. This gives a very real economic advantage. Subsequent to the laboratory tests, steels were made on a larger scale in an electric furnace, and the laboratory results confirmed. Since then over 50,000 tons of these steels have been made in the open-hearth.

The carbon content is, of course, adjusted to the particular applica-

TABLE I.—COMPARISON OF CROMANSIL AND OTHER STEELS

*A. Approximate physical properties of various structural steels in the as-rolled or normalized condition with mass effect approximating 1-in. round stock.*

| Type of Steel | Carbon (Per Cent) | Heat Treatment | Yield Point (Thousands of Lb. per Sq. In.) | Ultimate Strength (Thousands of Lb. per Sq. In.) | Elongation (Per Cent In 2 In.) | Reduction of Area (Per Cent) |
|---|---|---|---|---|---|---|
| Cromansil | 0.20 | As-rolled or normalized | 60 | 90 | 28 | 62 |
| | 0.30 | As-rolled or normalized | 70 | 115 | 25 | 60 |
| | 0.40 | As-rolled or normalized | 90 | 140 | 20 | 50 |
| Silicon-manganese | 0.30 | As-rolled | 65 | 110 | 25 | 52 |
| | 0.30 | Normalized | 70 | 100 | 28 | 60 |
| Manganese, 1.50% Mn | 0.30 | As-rolled | 60 | 95 | 24 | 55 |
| | 0.30 | Normalized | 60 | 95 | 28 | 60 |
| Silicon, 0.40% Si | 0.30 | As-rolled | 50 | 90 | 22 | 50 |
| Structural steel | 0.25 | As-rolled | 38 | 65 | 24 | 45 |
| *B. Approximate physical properties of various Cromansil steels as oil-quenched and drawn.* | | | | | | |
| Cromansil*, 0.38% Cr | 0.34 | Oil-quenched and drawn | 136 | 151 | 18 | 50 |
| Cromansil*, 0.73% Cr | 0.34 | Oil-quenched and drawn | 178 | 201 | 10 | 42 |
| Cromansil*, 0.95% Cr | 0.34 | Oil-quenched and drawn | 151 | 167 | 15 | 48 |

*These particular Cromansils contain 0.91 per cent Si and 1.04 per cent Mn.

TABLE II.—PHYSICAL PROPERTIES OF TYPICAL CROMANSIL STEELS

*A. As-Rolled or Normalized*

| Type of Material | Analysis (Per Cent) C | Cr | Mn | Si | Condition | Yield Point (Thousands of Lb. per Sq. In.) | Ultimate (Thousands of Lb. per Sq. In.) | Elongation (Per Cent in 8 In.) | Reduction in Area (Per Cent) | Izod | Brinell |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Staybolts (1-in. round) | 0.05 | 0.25 | 1.12 | 0.87 | As-rolled | 54 | 71 | 31 | 75 | 64 | 125–135 |
| | | | | | Lime cooled | 51 | 65 | 33 | 78 | 87 | ..... |
| | | | | | Sil-o-cel cooled | 53 | 65 | 46* | 78 | .. | ..... |
| | | | | | Normalized | 45 | 68 | 45* | 78 | .. | ..... |
| | | | | | Normalized and drawn at 1290 deg. F. | 55 | 65 | 44* | 79 | .. | ..... |
| Boiler plate | 0.21 | 0.47 | 1.17 | 0.72 | | | | | | | |
| ½-in. plate | | | | | | | | | | | |
| Longitudinal | | | | | As-rolled | 50 | 92 | 20 | 56 | 36 | 200–220 |
| Transverse | | | | | As-rolled | 51 | 91 | 18 | 54 | .. | ..... |
| 1-in. plate | | | | | | | | | | | |
| Longitudinal | | | | | As-rolled | 51 | 99 | 16 | .. | .. | 200–220 |
| Transverse | | | | | As-rolled | 51 | 98 | 14 | .. | 25 | ..... |
| 1½-in. plate | | | | | | | | | | | |
| Longitudinal | | | | | As-rolled | 56 | 89 | 19 | .. | .. | 200–220 |
| Transverse | | | | | As-rolled | 53 | 89 | 17 | .. | 24 | ..... |
| 2-in. plate | | | | | | | | | | | |
| Longitudinal | | | | | As-rolled | 53 | 86 | 20 | .. | .. | 200–220 |
| Transverse | | | | | As-rolled | 54 | 88 | 15 | .. | 20 | ..... |
| ½-in. plate | 0.21 | 0.51 | 1.09 | 0.64 | Normalized | 53 | 94 | 20 | .. | .. | 200–226 |
| ⅜-in. plate | 0.22 | 0.43 | 1.15 | 0.87 | Normalized | 74 | 105 | 29* | 50 | 32 | 210–230 |
| Structural shapes: | | | | | | | | | | | |
| 2x2-in. bar | 0.32 | 0.46 | 1.07 | 0.44 | As-rolled | | | | | | |
| Center | | | | | | 65 | 99 | 27* | 64 | .. | 200–220 |
| Edge | | | | | | 68 | 107 | 25* | 62 | .. | ..... |
| ⅜-in. plate | 0.31 | 0.42 | 1.13 | 0.87 | As-rolled | 72 | 119 | 23* | .. | 42 | 225–245 |
| ⅜-in. plate | | | | | | | | | | | |
| Longitudinal | 0.46 | 0.67 | 1.19 | 0.82 | As-rolled | 88 | 142 | 20* | .. | .. | 265–285 |
| Transverse | | | | | As-rolled | 91 | 143 | 19* | .. | 20 | ..... |
| Longitudinal | | | | | Normalized | 160 | 148 | 20* | .. | .. | ..... |
| Transverse | | | | | Normalized | 101 | 140 | 20* | .. | 23 | ..... |
| *B. Oil Quenched from 925 Deg. C. and Drawn* | | | | | | | | | | | |
| Engineering steel | 0.32 | 0.46 | 1.07 | 0.94 | 325 deg. C. draw | 131 | 172 | 11* | 32 | 11 | 364 |
| | | | | | 425 deg. C. draw | 111 | 145 | 15* | 50 | 14 | 311 |
| | | | | | 575 deg. C. draw | 100 | 128 | 22* | 58 | 65 | 255 |
| | | | | | 625 deg. C. draw | 89 | 112 | 24* | 60 | 83 | 217 |

*Results marked * are per cent in 2 in.

NOTE.—The physical properties of the boiler plate and structural shapes listed were measured on samples taken from commercial material made from 100-ton open-hearth heats. The plate specimens were tested in rectangular full-size sections, not in the usual ½-in. round form.

tion and, in general, is much lower than would necessarily be the case where plain carbon steels have been used. This is well illustrated in the following list of suggested uses:

| | Carbon, Per Cent |
|---|---|
| For staybolts | Not over 0.10 |
| For boilers and pressure vessels | 0.17 to 0.22 |
| For high-strength seamless tubing (oil-well casing and ship plates) | 0.30 to 0.35 |
| For heat-treated parts | 0.35 to 0.40 |
| For parts to be tempered after normalizing | 0.40 to 0.65 |

A number of surprising special effects developed in the commercial application, some of which had been anticipated from the laboratory work. The solidification of the Cromansil steels in the ingot is very different from that of either straight chromium or manganese steels; segregation is low and dendrites are small. The surface of the ingot is particularly good, and the rolling mill record on seamless tubes shows unusually high yield due to the absence of seams. The scale, formed in rolling, flakes readily and is not objectionable, and the properties of the material as rolled are almost as good as after a normalizing treatment.

Not a single instance of relatively brittle material on rolling has been encountered, so that these steels may be used to full advantage directly as they come from the rolling mill. Moreover, there is surprising latitude in finishing temperature on rolling, and this, of course, is partly responsible for the uniformly satisfactory properties in the as-rolled condition. These properties compare most favorably with those of other structural steels, and a comparison is shown in Table I.

### Structure Is Uniform

The microstructure of the as-rolled steels is remarkably uniform, as shown in the illustrations. It will be readily recognized that the steels are pearlitic in character, although the pearlite is so fine as to be readily mistaken for sorbite. Crushing tests, drift tests, punching tests and the like all show the adaptability of this steel to the usual manufacturing operations and indeed no difficulty on this score has been experienced; in fact, the material has been fabricated like plain carbon steel with practically no modifications in procedure.

The welding properties of the steel are also remarkable; in the boiler plate grade, for example, welds of 95,800 lb. per sq. in., with reasonable ductility, are possible. In Table II a list is given of compositions for various purposes, with the physical properties. All of these figures are taken from mill tests and are representative. The figures are sufficiently striking to need no further comment.

In this day of many alloy steels the selection of a particular one for a given application is difficult. In general, with suitable balanced analysis, physical properties are within a close enough range so that almost any one of the steels would be suitable. Thus other factors, such as uniformity in production and ease of production, ease of fabrication, ability to weld, and last but certainly not least, cost, receive more consideration. It is in these particulars that the advantages of Cromansil steels are outstanding. The low cost, combined with the other desirable features including "alloy steel physicals," indicates their use in many applications where the substitution of alloy steel for carbon steel has not as yet been considered.

▲▲▲

## Says Motor Transport Should be Regulated

The serious problems confronting the railroads, as a result of competition from motor and water transportation, was outlined by H. C. Stein, assistant to the president of the Central Railroad of New Jersey, at a meeting of the New Jersey chapter, Institute of Scrap Iron and Steel, in Bayonne, N. J., Dec. 21.

The difficulty of reducing freight rates and earning fixed charges, was demonstrated by the fact that motor buses earned more than $1,000,000,000 in passenger revenue, and motor trucks more than $2,000,000 in freight revenue during 1930, which, according to Mr. Stein, has created the financial plight in which the railroads now find themselves. He urged that fair regulation be imposed upon motor and waterways transportation, so that the railroads may have an opportunity to compete.

Others who spoke included N. G. Campbell, freight agent of the Central Railroad of New Jersey; Herman D. Moskowitz, president of the institute; Judge H. B. Dembe, Bayonne, and Benjamin Schwartz, director general of the institute.

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## Urges Scrap Dealers to Study Alloy Problem

One-third of the steel production in the next 10 years will be composed of rustless steel, was the prediction of Joseph Petch, sales department, Republic Steel Corpn., at a meeting of the Chicago chapter, Institute of Scrap Iron and Steel, Dec. 16. American industry, he said, is entering into the age of alloy steel and the problems confronting the scrap iron dealers of the country will be complicated, as a result of the tremendous tonnage of alloy steel returning to the scrap piles.

Mr. Petch traced the development of alloy steel from 1921, when the automobile industry demanded light weight and strength in the steel entering into its products. From an alloy content of approximately 1 per cent in most mild steel produced at that time, the alloy content has increased, in the past 10 years, to 18 per cent and more in the rustless steels of today.

As most steel mills do not want alloy scrap, particularly chrome, under present open-hearth practice, he said that the cooperation of consumers, producers and merchants of scrap will be necessary to solve the problem and create uses and markets for alloy steel scrap. The modern scrap dealer must learn chemistry, study sources of steel used by the producer, from whom he purchases his scrap, and must carefully segregate his material, if he is to serve the steel industry. On the other hand, the steel mills must share the burden of cautioning users of their products to segregate the scrap so that it may be properly marketed and remelted. Mr. Petch suggested that ultimately the companies prducing alloy steel will install special induction furnaces, which will enable them to use alloy steel scrap. Until then, the problem is one of proper segregation by the scrap dealer, and a study of special markets where these grades may be used.

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## Die Making Continued at Keller Plant

The jobbing die business formerly conducted by the Keller Mechanical Engineering Corpn., Brooklyn, acquired by the Pratt & Whitney Co., will be taken over by the Mechanical Die & Tool Co., operating at the former Keller plant, 70 Washington Street, Brooklyn. Some of the former personnel of the Keller company are associated with the new organization, which is a division of the Insulation Mfg. Co., 11-19 New York Avenue, Brooklyn. Other business of the Keller Mechanical Engineering Corpn. has been removed to Hartford, Conn., as a division of the Pratt & Whitney Co.

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## Announces Lower Prices on Speed Reducers

A lower schedule of prices has been announced by the Falk Corpn., Milwaukee, on its line of speed reducers in 17 types and 202 sizes, ranging from 1000 hp. to 0.5 hp. The reduced prices apply to all sizes in common use.

# GIVES RULES FOR GAS OR ARC WELDING RUSTLESS STEEL

## Suggests Initial Welding on Polished Surface—Urges Final Annealing of Finished Product

MUCH practical information on welding high chrome-nickel alloy steel, of the 18 per cent chrome, 8 per cent nickel variety, was included in a paper presented by L. W. Hostettler, of the Allegheny Steel Co., Brackenridge, Pa., at the recent National Dairy Exposition.

When it was found that lock-seamed and soldered joints were not practical with this metal, Mr. Hostettler said, the fabricator turned to welding, but here again the tendency was to use too light a gage of metal, necessitating the oxy-acetylene method.

In this process, however, there was danger primarily of lack of flame control, and a flame on the reducing side obviously produced an excess of carbon in the weld metal itself. He then briefly outlined what happens with the various types of flame.

"With an oxidizing flame," he said, "the metal bubbles and flows unevenly, resulting in a porous condition. A neutral flame improves this condition considerably, but with the lack of flame control it is found in actual practice that both porous and sound welds are developed. Therefore, the operator is forced to go to the reducing side sufficiently to assure a reducing flame, as a neutral flame cannot be maintained.

"A slightly reducing flame will build up the carbon in the deposited weld metal about 15 points, while a full reducing flame will build it up as high as 50 to 60 points. This excessive carbon build-up tends to make brittle welds and also lowers the corrosion resistance of the metal itself."

Another problem in oxy-acetylene welding, as pointed out by Mr. Hostettler, is to keep the piece from either buckling or building up excessively high work strains. This may be overcome by use of jigs and chill plates, but these are expensive. He then listed the following rules as comprising the best technique to follow in oxy-acetylene welding the 18-8 alloy.

### Describes Good Gas Welding Practice

**1—Use an uncoated rod of 18-8, preferably of a low carbon content (not exceeding 0.10) and with chromium content not less than 19 per cent, and nickel, not less than 8.50 per cent.**

**2—Use jigs and chill plates.**

**3—Use tips one or two sizes smaller than for the same job in mild steel.**

**4—Use tips that have not been reamed to a point that spreads the flame fanwise.**

**5—Use gages that are in good condition.**

**6—Use a soft, slightly reducing flame.**

**7—Do not puddle, as porous welds will be a sure result.**

**8—Direct the flame at a slight angle in the direction of the weld to be made.**

**9—Use a filler rod whose diameter is approximately the thickness of the material being welded.**

"The fact that oxy-acetylene welded equipment was not altogether satisfactory," said Mr. Hostettler, brought many fabricators to the metallic arc method of electric welding. This was found to give much better results when they had mastered the technique.

"They soon found, however, that it was impractical to weld lighter than No. 16 gage by this method. In fact, it is only during the past year that it has been accomplished commercially. It is the direct result of experience and requires extreme care on the part of the operator.

"No. 14 gage is much easier to handle than the lighter No. 16 gage and the average welder finds that No. 12 gage is the ideal thickness, as he has sufficient metal to work with, and when the bead is ground off there are practically no blow holes to spot."

The high electrical resistance of the high chrome-nickel alloy adapts it particularly to metallic arc welding, said Mr. Hostettler, who suggested the following technique for obtaining the best results:

1.—Reverse polarity [work to be the negative (—) electrode].

2.—Select a machine, if possible, with the greatest range of power input control.

3.—Use an 18-8 fluxed or coated filler rod with a maximum of 0.10 carbon and a minimum of 19 per cent chromium and 8.50 per cent nickel. The flux should contain no carbonaceous compound. This, to prevent carbon build-up in the weld metal.

4.—Use a medium short arc with just enough power input to maintain the arc. This short arc and minimum power input is harder for the operator to handle, but gives better flux protection to the molten metal and a much sounder and porous-free weld as there is not the tendency for oxide to pollute the weld metal. It is also a trifle slower than if more power were used, but the additional time is more than compensated for by the absence of pin holes.

5.—Have the metal to be welded clean and entirely grease free.

6.—Before striking an arc with a new filler rod in continuing a weld, removal of the oxide on the welding bead will be a decided aid in preventing a pocket or pin hole at this point. A stiff wire brush is used by some operators, but the best results are attained by using a high-cycle, lightweight, electric grinder, with a soft wheel."

In addition to these rules, Mr. Hostettler pointed out that it is general practice to weld from the back, or unpolished side of the sheet, using power input sufficient to get uniform depth of penetration for the subsequent grinding of the bead on the penetration side.

### Suggests Initial Welding on Polished Side

"On No. 12 gage and heavier, however," he said, "it has been my observation that the fabricators who weld on the inside, or polished surface first, using a short arc and minimum power input, with no attempt to get any depth of penetration, and then run a bead on the back or unpolished surface, with normal penetration and a built-up bead for strength,

(*Concluded on page* 1692)

# SHEETS vs. STRIP STEEL FOR STAMPINGS

THE general differences in the manufacture of sheet and strip steels of the low-carbon variety as utilized primarily for deep and extra-deep-drawing automobile stampings were discussed by Edward S. Lawrence, metallurgical engineer, Duraloy Co., Pittsburgh, in a paper read before the American Society for Steel Treating at Boston. He contrasted some of the most common defects and limitations encountered in the manufacture of strip steel for this particular and ultimate use with some of the more common defects attributed to the manufacture of sheet steel. He emphasized the adaptability of strip steel as made on a continuous four-high mill as breakdowns to be used on a conventional two-high mill.

"We find the consumer attempting to run a certain gage and size of both sheet and strip for the same deep-drawing part and, in this respect, a great deal of trouble is often encountered," said Mr. Lawrence. "It has been frequently emphasized that a die properly set up for a soft sheet will not produce to good advantage the same stamping as made from either a somewhat stiffer or harder sheet or from strip.

### Die Clearances Affected

"A clearance between punch and die is often set up for sheet steel which, on an average, will show a difference of about 2000 to 10,000 lb. less tensile strength, and approximately the same less number of pounds difference in elastic limit, compared with a normalized sheet or strip steel. This difference in tensile strength and elastic limit might be taken into consideration when we know that we can produce, for these dies, sheet or strip showing this marked difference in ultimate and elastic strengths, although the Rockwell hardness and the carbon content of both may be identical.

"The stiffer or harder sheet or strip then produces wrinkling in the part to be formed. For this reason we cannot agree with one authority who states that 'the Rockwell test is an indication of tensile strength.'

"Prior to the advent of sheet normalizing furnaces, double-box-annealed sheet was used. This was soft, very ductile, and had a fairly large grain structure. This soft, putty-like sheet formed shallow stampings quite readily when sufficient clearance was allowed in the dies. More difficult and deeper stampings demanded a normalized and box-annealed sheet, which, having a much finer but tougher grain structure, also induced a certain amount of stiffness not heretofore encountered.

### Buckling in the Dies

"This resulted in a buckling of the material in the dies having a large clearance. To use this stiffer sheet, dies were therefore altered to take care of this change in processing. Now we have strip steel which, although normalized and possibly box annealed, has a much smoother surface and a greater tendency toward stiffness in forming than the normalized sheet steel, even though both may have the same Rockwell hardness and may even show the same ductility value.

"It must be expected that consumers will have to take care of this discrepancy. Therefore, we are led to conclude that they must specify either strip or sheet for the particular part intended, or make allowances in the adjustment of dies for these two mechanically different processed products.

"Furthermore, the thickness of material desired for the automobile body part should be specified in decimal dimensions. If ordered in gage thickness, sheet and strip will vary, as sheet is rolled to United States gage and strip is rolled to Birmingham wire gage. The decimal difference between these two products for the same gage number, coupled with the allowable gage variations will often cause breakage of the part, even though the sheet or strip is quite capable of making the draw.

### Stiffness and Hardness Differ

"So long as the present distinctly different processing methods exist between sheet and strip, we will always have a differential of stiffness and hardness between these two products. The consumer must make allowances for these differences. While it means practically nothing so far as ductility, grain size, or depth of draw are concerned when comparing the two products, it does influence the type of punch and die setup.

"It has already been indicated that the high stiffness characteristic of strip steels causes an excessive wear on the dies. As these and other factors are gradually brought to the attention of both strip and sheet manufacturer, as well as the consumer, there will be a tendency toward fewer grades of deep and extra-deep-drawing materials.

"This, however, will come only when the sheet and the strip manufacturers are willing to divulge to their consuming public the basic knowledge of the manufacture and application of their sheet and strip steels; and, furthermore, when the consumer will divulge similar knowledge to his suppliers."

### Differ Respecting Box Annealing

BOX annealing has been practiced for possibly 200 years, according to the author of this paper, and it is something which we should take means to get rid of, although inertia may preserve it for another 200 years.

But Thomas Dockray, Eastern Rolling Mill Co., Baltimore, who participated in the discussion, contended that box annealing is still a very useful tool. It confers certain properties on sheets which normalizing can never do, he said.

Getting rid of box annealing, according to Mr. Lawrence, would be based upon an effort to get a uniformity in grain in the softening action of the process. This, he believes, normalizing will confer to a better degree than the method of box annealing which has been so long in vogue.

Soft steel may load up the dies with particles of metal, according to H. D. Morton, of the Hoover Ball Co., who also discussed Mr. Lawrence's paper. For this reason a greater clearance between the dies is needed for the same character of deep-drawing than is required when forming products from harder steels.

# STEEL INDUSTRY FACES SLOW GROWTH

By WILLIAM WREN HAY

**INCREASE in capacity tends to parallel growth of "normal" production. In other words, gains in capacity are limited by expansion of population, now at a diminishing rate, and increases in wealth. Normal production of steel ingots is now rising 2.55 to 2.62½ per cent a year, according to the author.**

THE steel industry has passed its period of initial development and now seems to be stabilized, i.e., limited in growth by the factors of population and increasing wealth. In the readjustments that lie ahead are to be found the best evidence of the validity of this statement. Some of the maladjustments that will have to be corrected by the steel industry include lower price levels, dislocation of capacity, and competition with other materials. Individual producers who adjust themselves to changed conditions may survive, but inefficient units will be eliminated in the process.

The statistical evidence of stabilization is now plainly to be read, and the effect on capacity changes, as well as the effect of newly located capacity, leads to some interesting conjectures.

Those responsible for securing the earnings on capital now found to be invested in stabilized industries must of necessity plan far ahead. Steel is a fundamental material so universally used and so standardized that, in the long run, competition is on a price level which is made by the lowest cost producers. For the time being we can neglect the patented alloys and special steels because their influence on tonnage has so far been small. They may be an important factor in future years. A viewpoint based on the normal or secular trend of production is particularly important at this time because the necessary adjustments are more favorably undertaken in poor times like the present.

Steel ingot production rises to peaks in pretty well-defined cycles of about three years in length. The wave-like rise and fall of annual production takes place about its secular trend, which we call normal production. Normal production of steel ingots is now increasing at an annual rate of 2.55 per cent to 2.62½ per cent, which is to say that it tends to double in about 26 years. When tonnage gets above normal, all is well. Very few operators have accustomed themselves to the fact that every rise above normal is followed by a reaction that carries tonnage below normal, or vice versa. There seems to be a tendency on the part of managers to ignore the cyclical changes that take place in industry, although it is a well known and much commented fact that steel is either a prince or a pauper.

### Relation Between Normal Production and Capacity

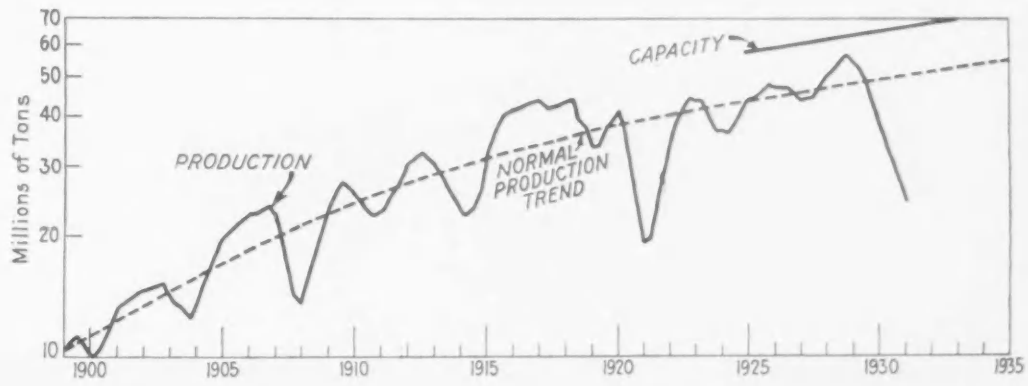
There is a very definite relation between normal production and capacity to produce. In the long run capacity tends to parallel normal production. In the case of steel ingots, capacity tends to exceed normal production by one-third, i.e., normal production is about 75 per cent of capacity. For various reasons capacity sometimes gets too high. It then takes a few years for the industry to absorb such excess capacity and the pressure to use all capacity is uneconomic and demoralizing until the balance is restored. Right now capacity is much too large for a healthy condition.

This relation between capacity and normal production was correct in the years before the World War. Then the war-time urge to produce as much steel as possible resulted in building up capacity far beyond normal requirements for many years ahead, and it required several years to absorb the excess. By 1923, when the automobile industry reached its present importance to steel, capacity was below requirements for normal production and it was not until three years later that the balance was restored. By this time, the migration of producing centers was well under way and the outcome was more excess capacity.

### New Steel Centers Have Dislocated Capacity

Increased capacity is brought about by (a) new construction and (b) improvements. It was estimated some years ago that nearly one-half of the capacity increases during the eight post-war years, 1920 to 1927, "came about by mills working more and more efficiently . . . and by the making of improvements apart from the construction of new units."* During the last few years, a much larger

*New York *Times*, April 30, 1928.




YEARLY totals by quarters disclose the cycles of steel ingot production. The secular trend, or normal growth curve, determined from a calculation of per capita production, is the most probable trend. To eliminate cyclical fluctuations the per capita production trend is calculated on the basis of a nine-year moving average. Capacity tends to parallel production, averaging about one-third above normal output.

proportion of added capacity has come from new construction. When "Pittsburgh plus" basis became inoperative, entrepreneurs were encouraged to erect new steel mills close to large consuming centers. In effect, a migration was started which reached its climax with the construction of large units in the Detroit area. The tonnage that these newly located mills will supply to the makers of automobiles may be counted as permanently lost by other older steel districts. An increase of 6 per cent in capacity during 1930 was abnormal and will have to be absorbed. Older districts will have to secure new outlets for their lost tonnage.

**Modernization Will Help**

There is still room for considerable reduction of costs by the addition of modern equipment in mills which heretofore got along when prices were higher. The struggle that is going on now to reduce costs by improving methods and raising the efficiency of old mills will necessarily result in still more increases in capacity.

Perhaps the most effective tool for reducing costs will be further electrification of the industry. It is now 40 years since the first application of electric power to steel mills. At the present time, it is doubtful if much more than two-thirds of all power used in the steel industry is electrical power. Yet the advantage that an electrified mill has over the old steam mill grows larger year by year. At the end of last year only about 40 hp. per ton of rated ingot capacity was connected with steel rolling mills. Connected horsepower doubled in the decade 1921-1930 and the next ten years will probably witness another 50 per cent increase, to 60 hp. per ton.

In the long run, temporary maladjustments will be corrected by the collective action of managements. The present dislocation is due to the individual action of various entrepreneurs. In an industry as stable as the steel industry now is, with demand limited to current needs that are increasing but slowly with our diminishing population growth, the usefulness of mere expansion as compared with cost reductions is now out of balance. The profits of these new producing units will eventually be limited to the competitive returns secured by the whole industry. Further additions to capacity by new construction will be limited to special circumstances. Eventually normal production will catch up with capacity and from then on the increases will come through improvements, to the benefit of the entire industry.

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Canadian bridge and structural steel industry in 1930 did work valued at $26,055,783, according to the Dominion Bureau of Statistics. The industry, comprising 13 plants, includes concerns engaged in fabricating and erecting structural steel for bridges, buildings, etc.

## River Steel Shipments Declined in November

Iron and steel shipments on the Ohio River in the Pittsburgh district in November amounted to 42,247 net tons, according to the United States Engineer Office, Pittsburgh. This compares with 49,059 tons in the preceding month, and with 95,644 tons in November, 1930.

Monongahela River commerce amounted to 24,338 tons in November, compared with 24,383 tons in the preceding month and 75,202 tons in November, 1930. Only five tons of steel was moved on the Allegheny River in November, compared with 2705 in October and 17,850 tons in November, 1930.

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## Steel Castings Orders Lower in November

WASHINGTON, Dec. 29.—Orders for commercial steel castings totaled 20,000 tons in November, according to preliminary figures received by the Bureau of the Census from 131 establishments. The bookings reflected a decline of 2851 tons from those of October. In 11 months of 1931, orders aggregated 372,792 tons, against 835,046 tons in the corresponding period of 1930. The November orders consisted of 7169 tons of railroad specialties and 12,831 tons of miscellaneous castings.

The November output was 23,109 tons, against 24,083 tons in October, and consisted of 7001 tons of railroad specialties and 16,108 tons of miscellaneous specialties. Production in 11 months of 1931 and 1930 totaled 415,128 tons and 945,582 tons respectively.

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## Automobile Production Low in November

WASHINGTON, Dec. 29.—Output of motor vehicles in the United States in November dropped to 68,867 units, against 80,142 in October, and was made up of 48,185 passenger cars, 19,683 trucks and 999 taxicabs. Output in 11 months of 1931 totaled 2,268,195 vehicles, compared with 3,200,285 in the corresponding period of 1930. The Canadian production in November was 1247 units.

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## Gray Iron Castings Business Declines

End-of-the-year decline in production of gray iron castings is reflected in the November report of the Gray Iron Institute. Production dropped from 47.6 per cent of normal in October to 37.1 per cent in November. New business dropped from 39.6 per cent to 26.5 per cent, and unfilled orders from 29.7 to 23.1 per cent. In November, 1930, production was 50.6 per cent, new business 37.1 per cent, and unfilled orders 24.1 per cent. Unfilled orders on Nov. 30 were only slightly below those of the same date in 1930.

All four districts reported a decline for November. Production in the New England and Canadian districts was 38.2 per cent in November, compared with 44.3 per cent in October. In Ohio, Pennsylvania, Michigan and Indiana it was 38.9 per cent, compared with 40.3 per cent the previous month; in Wisconsin and Illinois 31.3 per cent, against 46.8 per cent, and the Chicago district 43.3 per cent, compared with 50.2 per cent the previous month. Business outlook was reported good by one foundry, fair by 27, poor by 45 and bad by 40.

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## Malleable Castings Orders Gain Slightly

WASHINGTON, Dec. 29.—Orders for malleable castings in November made a slight gain to 18,542 tons from 18,145 tons in October, according to reports received by the Bureau of the Census from 115 establishments. In 11 months of 1931, orders were 278,354 tons, against 449,392 tons in the corresponding period of 1930. The November, 1931, production was 17,678 tons, against 20,123 tons in October, while for the 11 months of 1931 it was 285,895 tons, against 484,572 tons in the first 11 months of 1930.

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## Gives Rules for Gas or Arc Welding

(*Concluded from page* 1689)

get uniformly better results, so far as pin holes and pockets are concerned.

"The metallic arc method with the proper filler rod and technique," he pointed out, "produces a porous-free, ductile weld of good physical characteristics and practically no carbon pick-up."

As the metal immediately adjacent to the weld zone is likely to be heated to a temperature of about 1200 deg. F., and the indicated temperature range at which precipitation or dissociation of carbide occurs in an Austenitic steel is 800 to 1500 deg. F., Mr. Hostettler recommended that every piece of equipment welded or otherwise subjected to this temperature range be annealed as a unit, after fabricating, to insure that the alloy is in its very best condition.

In the dairy industry, however, he said that he did not look upon annealing as absolutely necessary, provided that the fabricator orders and receives materials of proper analysis and uses the proper technique and care during fabrication.

# Announce New Mult-Au-Matics

## Six and Eight-Spindle Machines Designed to Use New Cutting Tools—Smaller Model Also Built

TO anticipate future developments as well as to meet present demands in cutting tools and production requirements, the Bullard Co., Bridgeport, Conn., has brought out the type D Mult-Au-Matic and Mult-Au-Matic center lathes here shown. These are made in eight as well as six-spindle types, the former being especially designed for work where the number of required operations exceeds the possibilities of a six-spindle machine for efficient tooling combinations that will permit satisfactory completion of the machining within the time allowed. For smaller classes of work, a Mult-Au-Matic designated as the type C is also built.

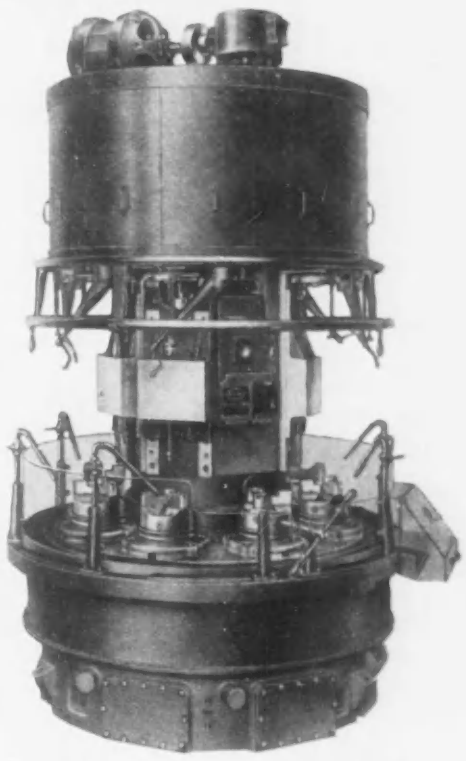
In addition to the six or eight-spindle design, the type D machines incorporate materials typical of the most recent developments in metallurgy, heavier construction with lessened vibration, full-automatic lubrication, anti-friction bearings, and a variety of multiple tool-carrying heads and drillheads to meet many different requirements. Increases in power, speed and feeds have been obtained.

The massive cylindrical base of these machines assures accurate alinement and serves as a rigid surface plate upon which the machine proper is mounted. To increase its rigidity, the new column has been materially strengthened through the cross-section areas of the side walls and ribs; corresponding to this added strength, it is more firmly secured to the base. On the lower part of the column is a long, adequately lubricated taper carrier-bearing and, at the extreme lower end, is mounted the lower ball race of a ball-thrust bearing. The tool-carrying heads are mounted on the upper part of the column. These are of improved design and massive construction. Their respective feed mechanisms are mounted on a strongly ribbed base secured to the top of the column above the tool-carrying heads. It is pointed out that this construction results in complete coordination of the three major working elements, spindles, feed-works, and tool-carrying heads.

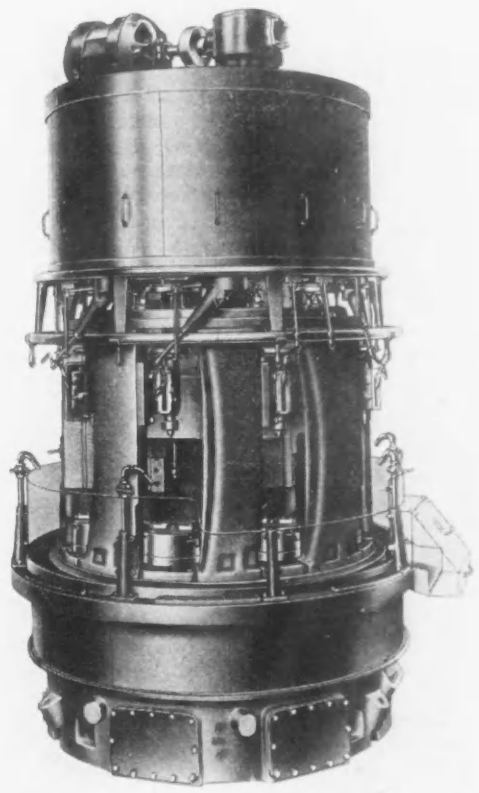
The carrier is a one-piece, heavily ribbed casting which affords solid support for the work spindles. Its long taper bearing on the column takes the side thrusts and permits of close adjustment. The vertically - adjustable ball thrust bearing not only takes the vertical thrust but also provides a firm support for the entire weight of the carrier and facilitates rotation of the carrier when indexing.

The work spindles, six or eight in number, are made of heat-treated forged steel, each mounted in a pair of roller bearings that provide for both vertical and horizontal thrusts. The drive gear of each spindle is of greater diameter than the work capacity of the machine; this permits an application of driving power appreciably in excess of cutting requirements, thus assuring a smooth, even flow of delivered power at the point of machining operations.

All spindles of the type D machine are equipped with an individual brake mechanism that brings them to a stop during indexing; this feature, in combination with the special rounded tooth form of the gears, makes for rapid and quiet meshing. Besides being suitable for use with mechanical power-operated chucking, the spindles will accommodate chucks or fixtures for manual operation.



Heavier construction and increased power, speed and feeds are featured. The eight-spindle, type D machine provides for additional tooling combinations



The type D center lathe, six or eight spindles, has capacity for 4-in. diameter work, 16 in. between centers.

The five or seven feed-works, applying respectively to the six or eight-spindle machines, differ from the company's former design in several respects, one of which is the replacement throughout of bronze bearings with anti-friction bearings. The former heavy construction has been made still heavier to withstand unforseen overloading and unusual conditions. Additional strength has also been given to the tool-heads and the hardened ways upon which they slide, this with a view to exceeding the demands of modern tooling. Sufficient distance is allowed from the face of the tool slides to the center of the spindles to permit the use of massive and rigid tool blocks.

Positive lubrication of all moving parts, as required by the heavier loads and faster speeds of modern machines, is supplied by a continuously driven gear pump which delivers oil from the reservoir through a filter to the drive bracket from which the lubricant is distributed to the feed-works, thence to the tool heads and other parts. The spindle bearings are supplied with filtered oil from an independent line. As on former models, the cutting compound system, including chip and coolant guards, is an integral part of the machine.

Specifications of the 16-in. size type D Mult-Au-Matic include: chuck capacity, 18 in. diameter, 9¼ in. height; standard gearing, 11 changes from

20.2 to 182 r.p.m. (spindle speeds can be set individually for any desired speed at each station). Drive is by direct connected 1760-r.p.m. motor, 30 hp. for the six-spindle machine and 35 hp. for the eight-spindle machine. The latter machine is 98 in. in diameter; its height from floor is 136¾ in., not including the motor. The type D machines are made in 12-in. and 8-in. sizes also.

The type D center lathe has capacity of 4-in. diameter, 16 in. between centers. Spindle speeds can be set individually and the standard gearing gives 11 changes from 46.8 to 421 r.p.m. The direct-connected 1760-r.p.m. driving motor is 25 hp. for the six-spindle and 30 hp. for the eight-spindle-machine. The eight-spindle machine is 87½ in. in diameter; its height from floor, excluding motor, is 136¾ in.

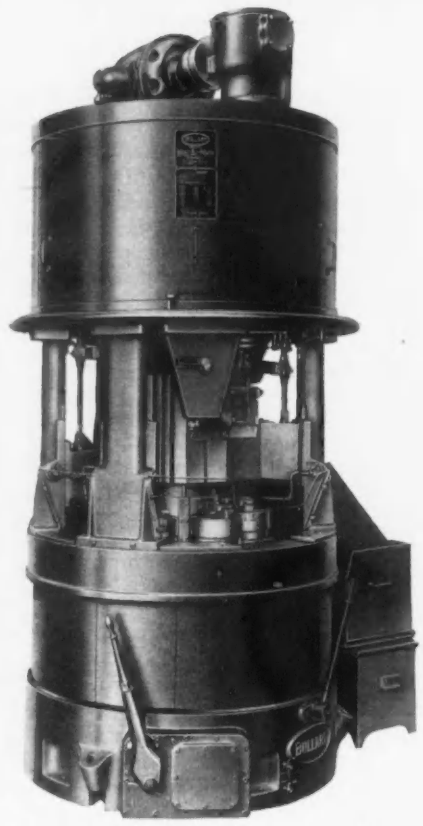
### Six and Eight-Spindle Mult-Au-Matics for Smaller Classes of Work

For rapid efficient production on the smaller classes of work the new type C machine, shown in the third illustration, is offered. Like the larger units, it has been considerably strengthened and made more rigid to make full use of the possibilities of modern developments in cutting tools. It exemplifies the company's fundamental plan of subdividing machine work to operations and work-units exactly meeting the mechanical requirements by providing balanced performance at high efficiency with simultaneous processing on multiple spindles.

It is made in six or eight-spindle models; five or seven stations are for the machining operations, the remaining station for chucking the work. Boring, drilling and reaming tools can be mounted at the respective work stations in conjunction with a variety of facing and turning tools. Proper feeds and spindle speeds are obtained at each station through a combined system of cam and change gears which actuates the main turret and tool heads. Through the combination of main head and tool-column heads at each of the work stations, it is possible to approach the smaller work from different directions for concentrated operations at close quarters and still to have sufficient room in the retracted position for easy tool setting.

A special feature of the type C machine is that core drills, reamers and boring bars are mounted directly on the main column which provides a uniform feed at all work stations. Tool-carrying slides are mounted on heavy tool columns rigidly secured to the upper and lower sections of the machine on their outer diameters. Equipment includes mechanically power-operated chucks.

This machine has a capacity for work 6¾ in. in diameter and 6 in. high. Spindle speeds can be set individually at each station. The primary change gears and independent spindle change gears are so designed that speeds may be obtained at frequent intervals in selective ranges respectively, within multiples of nine, from a minimum of 17 r.p.m. to a maximum of 707 r.p.m. The 1760-r.p.m. driving motor is 20 and 25 hp. for the six and eight-spindle machines, respectively. The eight-spindle type C Mult-Au-Matic has an outside diameter of 65¾ in.; overall height is 130¾ in.



**For smaller classes of work, the type C Mult-Au-Matic embodies the same features as the larger units.**

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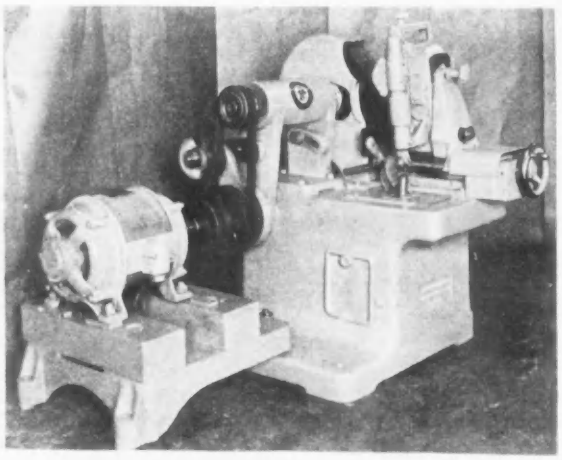
## High-Speed Centerless Feed Polisher and Buffer

A CENTERLESS feed polishing machine for cylindrical work up to 6-in. diameter, designed to cut down from the rough and to carry through to a fine finish, is shown in the accompanying illustration. Built by the Production Machine Co., Greenfield, Mass., the machine employs a new type of the company's belt feeding device for the feeding member and is intended to make skilled polishing labor unnecessary. Quick set-up is a feature and complete protection is afforded by hoods and guards.



The power centerless feed unit is combined with a high-speed polishing or buffing wheel from 10 to 16 in. in diameter and with 4-in. face. The mountings are heavy and substantial; Timken roller bearings are employed and Alemite lubrication is provided. The wheel spindle is driven by a 7½ to 10-hp. motor through Dodge triple V-belt drive; two spindle speeds are provided.

Specifications include: diameter of wheel spindle, 1¾ in.; overall height, 45 in.; floor space required for direct motor drive, 47 x 56 in.; for belt drive, 38 x 47 in. With belt drive, the machine weighs 1200 lb.; with motor drive, 1400 lb.

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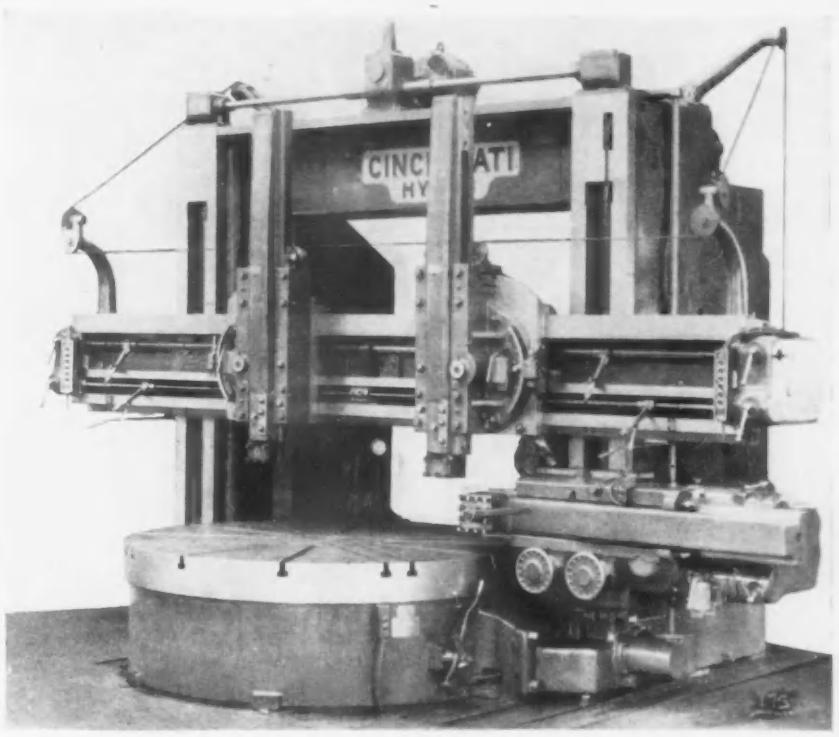
## Moisture-Proof Rubber Compound for Gaskets

GASKET material that is moisture proof and oil resistant has been placed on the market by the General Electric Co., Schenectady, N. Y. This material, designated as the No. 1000 compound, is a white, odorless, sulphur-free rubber compound, available both in sheets and molded shapes, which are described as being tough, strong and flexible and to require no sticker; gaskets can be used repeatedly in testing work, as well as in permanent joints. It is unaffected by exposure to the weather, and when under compression in properly made joints is not attacked by cold oil. Mildly alkaline solutions, such as derived from portland cement, or dilute acid solutions have no apparent effect on this material.

# New 96-In. Side-Head Boring Mill



The rail heads have individual motors for rapid-traverse and are lubricated from a central oiling station.

ADDED stiffness of housing supports, improved lubrication, a side-head of new design and other improvements feature the new 96-in. Hypro side-head boring mill announced by the Cincinnati Planer Co., Cincinnati.

Instead of being in two separate castings, the bed and extensions are cast integral to provide stiffer support for the housings which are bolted and tongued to the side of the bed. The tongues are integral with the bed, eliminating the possibility of movement of the housings when taking a heavy cut. Further strengthening is obtained by extending the front of the housings and bolting them to the center of the bed.

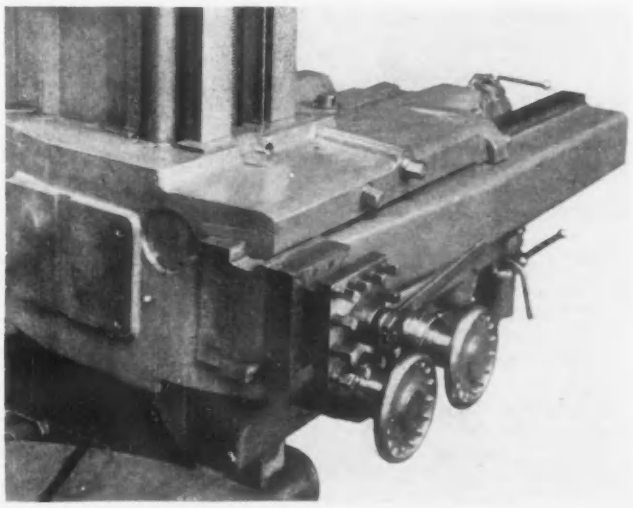
Forced lubrication is supplied to spindle bearings, track, and gear box from a tank underneath the spindle; an individual motor driven pump, mounted on the housing, forces filtered oil into the track and all revolving parts. An oil pressure gage is provided. The track is separate from the bed and can be replaced.

The heavy, deep table is driven with a steel spiral bevel gear and pinion having an anti-friction thrust bearing, which assures smooth cutting. The table-drive speed box is provided with four speed changes when using a d.c. variable-speed motor; in case a.c. only is available, a triple box is placed on top of the four-speed box, giving 12 changes for the table. All of these gears are made of steel and the bearings are lubricated by force-feed.

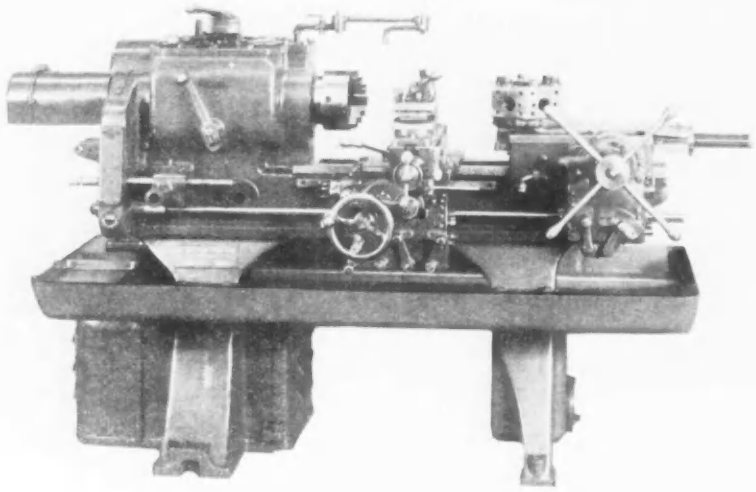
The rail heads, equipped with steel rams, are lubricated from a central oiling station. The head can be swiveled to 45 deg. each side of center by means of a worm and segment. A clamp on top of the saddle assists in holding the swivel rigid. The heads can be set at any position along the rail by moving fine-adjustment levers, placed conveniently for operation. The rail is described as being exceptionally heavy and rigid. An electric or mechanical rail clamp can be supplied; both designs have an interlock with the elevating motor so that it is impossible to raise or lower the rail while clamped or partly clamped.

A feed box with 12 changes is placed on each end of the rail and on the side head. All gears are of chrome nickel steel and hardened; they slide on hardened splined shafts. Anti-friction bearings, lubricated by gravity feed, are used throughout. Reverse feed mechanism is included in the feed boxes. Individual push button controlled motors connected with the feed boxes are used for rapid-traversing the heads in all directions. One head can be rapid-traversed in any direction without disturbing the others. An electrical interlock prevents engagement of a rapid-traverse motor while feed is being used.

The side head is of new design; a detail view shows how the saddle is placed on the housing. All tool pressure is absorbed by the heavy wall of the housing, located about 24 in. from the face. With the ram in any position, the resultant tool pressure always comes within the housing bearing. Taper gibs are provided throughout to take up wear and to maintain alinement. The saddle is cast with ram clamp in place, eliminating a large number of bolts. For feeding and rapid-traversing the side head, the same type of feed box unit is placed on back of the side-head saddle. Two handwheels are used for final adjustment of saddle and ram. A chip protector is placed around the side-head elevating screw. The counterbalance for the side head is inside of the housing.



WITH the side-head ram in any position, tool pressure always comes within the housing bearing.



# Universal Turret Lathe Features Increased Production

IMPROVEMENTS making for increased productivity are incorporated in a new No. 3 universal turret lathe brought out by the Warner & Swasey Co., Cleveland. The lathe has a 1½-in. bar capacity and a maximum swing of 15⅜ in. Six spindle speeds, from 67 to 740 r.p.m., are selected by means of conveniently located levers with forward and reverse provided for all speeds.

Chrome-nickel steel gears are used throughout. The head clutches, designed for high torque at low speed, can be adjusted quickly. The spindle is mounted in Timken double roller bearings, both front and rear. The entire head runs in a bath of oil; a splash system lubricates the head-end gear train which is fully inclosed and carries the feed spindle to the feed shaft.

The hexagon turret is mounted on a Timken roller bearing and can be adjusted for proper freedom of movement without interfering with its permanent alinement with center-line of the spindle. Automatic indexing, with an automatic turret binding mechanism, is provided. Backward movement of the slide automatically releases the turret clamp and indexes the turret; forward movement of the slide clamps the turret in position. The bearing surface under the turret slide is hardened. Six power feeds are provided for the hexagon turret.

The universal carriage is equipped with a quick-indexing square turret and is provided with six power cross and longitudinal feeds, both forward and reverse. The square turret cross slide has a long dovetail bearing surface, so made that it is not exposed to dirt or chips. A plunger pump delivers lubricant to all slide bearing surfaces as well as to the ways under the carriage and to the feed-pinion bearing. All moving surfaces receive lubricant from this one central point.

Control levers on both aprons are conveniently located; the power feed can be engaged and disengaged by a very slight pressure. An automatic feed throwout disengages the power feed at the end of cuts. Six stop screws for the cross slide carriage stop roll make possible the cutting of more than one diameter with one tool in the square turret. The bed casting is ribbed and made of semi-steel. A self-contained cabinet-leg motor drive is standard for the machine. For light duty, a 3-hp. motor is recommended; for heavy duty, a 5-hp. motor is supplied.

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## Tapping Machine for Rapid, Accurate Work

A HIGH-SPEED tapping unit in which tap breakage is said to be practically eliminated is being announced by the R. G. Haskins Co., 4636 West Fulton Street, Chicago. Maximum capacity is ¼ in. for brass and 3/16 in. for steel.

The self-contained tapping head unit incorporates a sensitive reversing mechanism that operates at high speed. It is entirely inclosed in a rigid two-piece aluminum housing and can be readily removed from the machine. Ball bearings are used on all main spindles. The collet shaft is hardened, lapped and chromium plated and runs in an amply lubricated hardened and lapped alloy-steel bushing. The tap is held by a collet chuck that centers it accurately and drives it by the square shank. The chuck is small and light, minimizing the inertia effect. Collets are furnished to take taps from Nos. 2 to 14 inclusive.

The machine is regularly furnished with gears for any two of the following standard tapping speeds: 1500, 1750, 2333, and 3063 r.p.m.; special gears are obtainable for tapping speeds of 2130, 2676, 3500 and 4090 r.p.m. Reverse speed is twice that of the tapping speed. Gears can be changed quickly by loosening the wedge lock and removing the tapping unit from the motor housing. Cutting lubricant is delivered to the taps by an automatic pump; the amount of discharge can be regulated and the nozzle is adjustable.

To support the tapping unit, a rigid split-ring arm is secured to the ground-finished hollow vertical shaft which is connected to the foot treadle and slides in two long bored and lapped bearings. All vertical moving parts are counterbalanced by a weight within the machine frame and a suitable spring is provided to facilitate return of the tapping head and quick reverse of the tap. Vertical travel is limited by adjustable stops on the right side of the frame. The large work table is vertically adjustable on the pedestal base. Vertical movement of the tapping unit is actuated by means of the foot treadle in connection with mechanism that permits the tap to establish its own lead without stripping the thread or breaking the tap. Retapping is possible without injuring the threads.

The machine frame is of cast-iron, accurately machined. It can be furnished with pedestal base mounting, as illustrated, or arranged for bench mounting. Working parts are made of alloy steel, heat-treated and ground.

# Demand for Steel Continues to Sag

By DR. LEWIS H. HANEY
Director, New York University Bureau of Business Research

NO sign of improvement in the indicated requirements of steel-consuming industries appears in the November statistics. The decline in the "composite demand" line was not quite so large as a month ago, but it has fallen still further below the bottom level of 1921.

Steel ingot production, on the other hand, increased last month, so that our seasonally-adjusted index rose nearly to the level of August. It was at about the same annual rate as at the end of 1921. The spread between the indexes representing production and potential consumption has thus widened, and the "maladjustment" is now the largest in recent years.

At the bottom of the depressions of 1921, 1924 and 1927 the production curve fell below the demand line. If the relationship between the two holds, it seems that production will have to be curtailed considerably. If steel production was not excessive in October, it certainly was in November.

Decline of the composite demand line to a new low was caused by declines in railroad tonnage, building contracts, mineral production and agricultural purchasing power. All of these indexes are below the 1921 lows. Miscellaneous manufacturing production (excluding steel and automobiles) declined also, although it still is higher than at any time in 1921.

Only machine tool orders and automobile production showed gains in November, and both indexes were only slightly above the 1921 bottom.

### In Particular Lines of Activity

PURCHASES of steel by *railroads* are not likely to increase soon. Orders for locomotives were larger in November than in October or a year ago, but freight car orders slumped. The usual talk about rail buying tending to sustain steel production at the year-end is less conspicuous now than usual. Weekly carloading figures do not suggest any let-up in the declining trend, and November reports indicate a drop in earnings below the unsatisfactory results of a year ago. Acceptance by the Interstate Commerce Commission of the roads' amended plan for loaning the proceeds of rate increases will hasten the relief, but any beneficial effects of rate increases are still a future development. Increases in the volume of traffic, however, await a stabilization of prices. Continued sagging of commodity prices gives no hope for early gains from this source.

Stabilization of *building* has not yet appeared. The value of permits and of contemplated new construction and the volume of contracts all fell off sharply in November and are below the lows of 1921. The severe slump in orders for fabricated structural steel reflects this development.

*Automobile* production may be near bottom, but producers are not making many more cars than are needed to supply their dealers. Sales of steel sheets and of malleable castings do not yet show an uptrend.

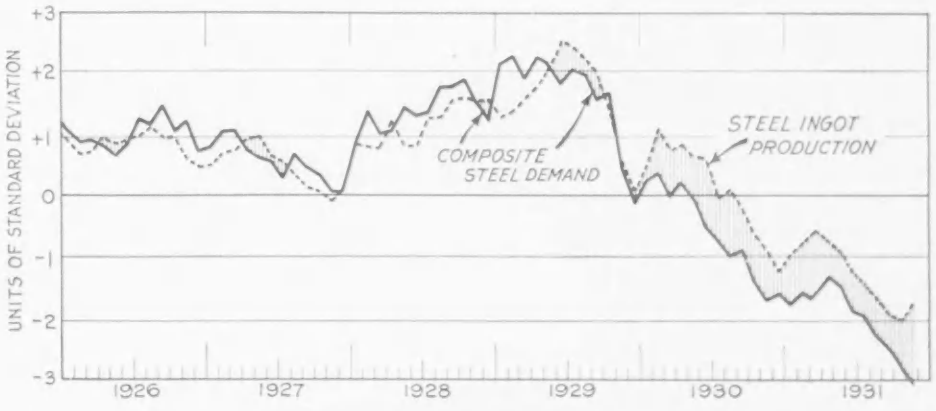
*Miscellaneous manufacturing* activity is further above the 1921 bottom than any of the items in the composite. The action of this index suggests that consumption lines are less affected than others by the depression, but the trend is still downward.

*Oil* production increased after artificial restrictions were moderated, and the larger supply and lower prices have tended to slow down drilling activity. Copper producers have agreed to curtail production to 26½ per cent of capacity.

*Agricultural* buying power is one of the least encouraging items. Possibly wheat prices have touched bottom, and other farm products might stabilize, but price firmness depends on curtailed output.

*Exports* can hardly be expected to increase while exchange rates discourage outward movements and tariff walls are being raised abroad.

Add to all this the general decline in profits, reduction in surpluses and weakened credit—which tend to limit buying more surely to current requirements—and the reason for doubting early improvement in the steel industry is apparent.




FURTHER spread between supply and demand is not a hopeful sign. Until a balance between them is struck we can scarcely look for sustained improvement in business.

# This Issue in Brief

**Shorter work-day would merely doom industry to stagnation,** says economist. Industries should be permitted to regulate production in relation to demand, forcing capital into the development of new activities.—Page 1665.

* * *

**Short-legged trays contain Lincoln car parts** to be heat-treated. Tray bottoms are spaced pieces of pipe, which allow for air circulation and prevent tray warpage.—Page 1668.

* * *

**Heat-treating economy is promoted by pushing forgings through furnaces** on light-weight carrier shoes. Forging plant uses shoes instead of metal trays wherever possible, because heating the trays reduces furnace economy.—Page 1671.

* * *

**Chunk of bacon, tied to a stick,** is rubbed on aluminum ingot in European mill so that it will not stick to rolls. Here a mixture of oil and water is used to cool and lubricate.—Page 1674.

* * *

**Whether wall is thick or thin,** insulated or uninsulated, about the same amount of fuel is required to bring fuel-fired furnaces to operating temperature.—Page 1678.

* * *

**Don't let the roll finish fool you.** High luster may disguise a poor surface, whereas a matte finish may approach surface perfection. A good surface can be obtained only by cutting action.—Page 1683.

* * *

**More than credit control is needed** to prevent overextension of industrial capacity. Changes in our banking system would probably not succeed in controlling the psychology of business men, which exerts a powerful influence on credit fluctuations.—Page 1666.

**Heat-treating errors quickly traced.** Recorders of all Lincoln car heat-treating equipment are located in a central control room. All batches are identified with this record.—Page 1668.

* * *

**Surface defects in forgings are readily apparent** after dipping in sulphuric acid solution, washing in mild alkaline solution, and final washing in boiling water.—Page 1672.

* * *

**Coating formation on rolls for hot-rolling aluminum** helps prevent slippage and acts desirably as a heat insulator, but may mar the surface of the rolled product.—Page 1675.

* * *

**How long does it take for a heat-treating furnace wall** to become heat-saturated? **Answer:** 30 hr. for 9 in. firebrick, uninsulated; 50 hr. with 5 in. insulation; 60 hr. for 13½ in. firebrick with 2½ in. insulation.—Page 1680.

* * *

**Fast roll-grinding = better rolls.** Since cylindrical grinding unavoidably consists of numerous and small flat spots, obviously the faster the work travels, the longer the flat spots will be and therefore the shallower.—Page 1684.

* * *

**Low-priced, low-alloy steel has high strength.** "Cromansil" steel, containing chromium, manganese and silicon, each below 1.5 per cent, may create a new market for alloy steel, owing to modest cost.—Page 1687.

* * *

**When welding rustless steel,** use the metallic arc for best results. No. 12 gage is ideal thickness for welding. Weld on polished surface first, with short arc; then run a bead on unpolished surface, using normal penetration.—Page 1689.

**If you change from sheets to strips or vice-versa,** change your die set-up. Strip is usually stiffer, resulting in wrinkling unless dies are adjusted.—Page 1690.

* * *

**Detroit excited.** Production is subnormal. Factory executives' activity is abnormal, due to tuning operating lines to 1932 changes. Production in 1931 was probably below sales. January outlook is not promising.—Page 1702.

* * *

**Exports one million tons off.** Two million tons of iron and steel were shipped out of the country in 1930. Figure for 1931 will not reach one million.—Page 1701.

* * *

**Denies relation between tensile strength and Rockwell test.** Hardness and carbon content of sheet and strip steel may be identical, says steel man, but difference in ultimate strength and elastic limit may be marked.—Page 1690.

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**To avoid error, specify thickness in decimals** when ordering strip steel. Sheets are rolled to U. S. gage, strip to Birmingham wire gage. The difference, coupled with allowable gage variations, often causes trouble.—Page 1690.

* * *

**Housecleaning of 1931 promises profits** in 1932. Even if volume of business is below normal, manufacturers will be in a better position to make money.—Page 1706.

* * *

**Day of mushroom growth in steel industry is past.** With diminishing population growth and the steel industry stabilized, gain in capacity will be slow. Low-cost producers will dictate prices, says economist, eliminating the inefficient units.—Page 1691.

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MODERNIZATION and DIVERSIFICATION as practical weapons for industry to use to fight the depression will feature the subject matter of The Iron Age Annual Review and Statistical Number to appear next week.

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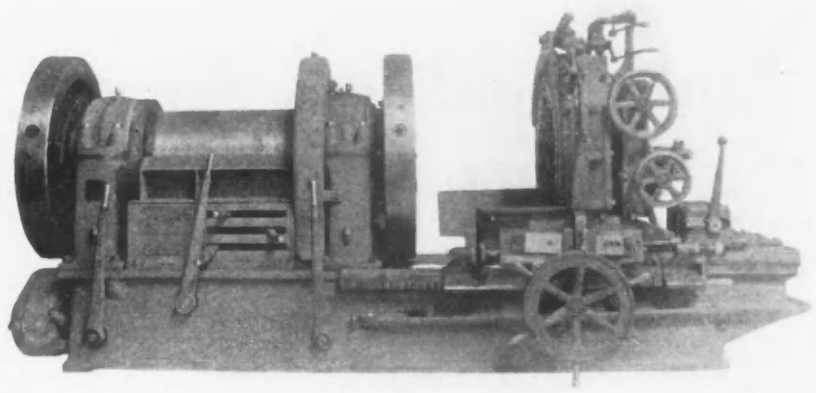

# New Pipe Threading and Cutting Machine for Large Work

A NEW pipe threading and cutting machine has been added to its line by the Landis Machine Co., Waynesboro, Pa., to take pipe from 4½ to 13⅜ in. outside diameter. Ordinary pipe, seamless and alloy-steel tubing can be machined with either standard or long thread lengths. The machine will generate a tapered pipe thread up to 8 in. long and in tapers of ¾ in. per ft. or less on all work within its range.

The receding chaser feature is designed to reduce cutting strain on the chasers to that required for a straight thread of like diameter and pitch and to assure accuracy and good finish. It also permits the use of a very narrow chaser, said to lower the initial chaser cost, to lengthen life of chasers between grindings and to effect other savings.

Universal adjustment for size and micrometer adjustment for the final setting is provided on the die head. Each graduation on the micrometer dial gives a variation of 0.001 in. in diameter. The die head, of two-cut type, can be used for roughing and finishing cuts, controlled by the same receding mechanism. The finishing cut can be made without any change in the diametrical adjustment.

Chaser-holder extensions, having a range from 4½ to 8⅝ in., can be fitted to the chaser holders so as to give the die head a total range of 4½ to 13⅜ in. The chaser holders are adjustable to and from the center to give an equal distribution of the cut.

Chasers 1 15/16 in. wide are employed for all thread lengths. They have an initial length of 4 in., but may be used in the chaser holder extensions after they have been ground to a 3-in. length or less. The same chasers can be used for any pipe size within the ranges of the chaser holders or chaser holder extensions, as long as the pitch, taper and thread form are constant. They are interchangeable with those of the 8⅝-in. machine announced in THE IRON AGE of Oct. 23, 1930.

The taper mechanism generates a straight line taper throughout the entire thread length. Its sine bar is easily and quickly adjusted for all tapers; a tapered plug provides a positive means for locating the sine bar for 3/16, ⅜ and ¾-in. tapers. Adjustment for thread length is simple and made permanent by a locking screw.

The sine bar retarding bracket, which actuates the taper mechanism, is adjustable for the length of pipe extending beyond the face of the chuck. It is set to have contact with the sine bar at the start of the thread. An automatic safety device releases it should the operator neglect to open the die head at the finish of the thread.

Located centrally between the guides of the machine, the leadscrew takes the load without binding the carriage. It has a coarse pitch thread with a round crest to facilitate the engagement of the leadscrew nut which is of the split (full-nut) type and is made of bronze. The leadscrew nut is engaged by hand and may be disengaged either automatically at the end of the cut or by hand. A pitch indicator is provided to assist the operator in the engagement of the leadscrew nut.

The pitch change gears are housed in a gear box at the headstock end of the machine. The intermediate gears are mounted on a floating carrier of new design which facilitates meshing. A single nut clamps the intermediate gears and their carrier in place.

Cutting coolant is supplied to the chasers through ducts in the bore of the die head so located that the cutting edge of each chaser is flooded. Quick-acting valves control the supply of coolant to both chasers and cutting-off tools. Provision is made for lubricating all sliding and rotating surfaces of both the die head and the machine.

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# Pipe Fittings for Welding

A NEW series of seamless, uniform-wall fittings for pipe welding is being offered by Tube-Turns, Inc., Louisville, Ky. Like all other tube-turns, the new series 1R fittings are seamless.

They are made by a process said to produce uniform wall-thickness at all points, insure uniform radius and eliminate all locked-in stress in the metal. Like all other tube-turns, the new series 1R has the same outside diameter, the same inside diameter and the same wall thickness and wall tolerance as the pipe with which it is used.

This, together with the fact that it is made of the same material, is said to facilitate lining up and welding.

Addition of the series 1R rounds out and completes the Tube-Turn line, affording 45-deg. and 90-deg. elbows and 180-deg. return-type fittings for welding in sizes ¾ in. through 20 in., and in virtually all the weights required by modern piping.

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Welding tube-turns into a gas scrubber connection in the field.

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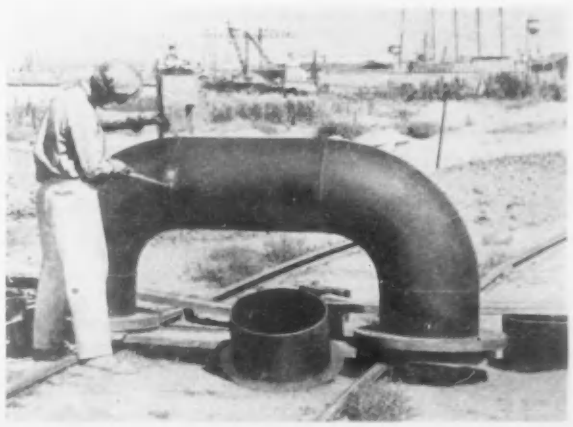

# Congress to Rush Legislation Aimed to Restore Confidence

By L. W. MOFFETT

WASHINGTON, Dec. 29.—Immediate consideration of domestic emergency legislation will be resumed by Congress when it reconvenes on Jan. 4. Matters of international character are being shoved still further into the background, for the temper of Congress to give less consideration to foreign affairs is growing. Manifestly, irritation toward Europe has increased.

The Basle report, proposing in effect either further scaling or cancellation of debts, together with reports abroad that the United States is about to abandon the gold standard and constant criticism of this country, have all built up a mood that, instead of stirring Congress to action regarding European affairs, has had the opposite effect. It is believed to be extremely doubtful that Congress could be induced to extend the moratorium. Unless there is a change of sentiment, it seems altogether likely that the administration will have great difficulty in getting such an extension, if it is asked.

### To Rush Domestic Legislation

In contrast to its attitude toward foreign affairs, Congress is evidently determined to rush through much domestic legislation of pressing importance. Partisan action will be reflected in some of it, yet on a number of the major questions Congress appears to realize its responsibility and is ready to cooperate with the administration. This will not be true of such measures as that dealing with taxation, but largely it appears to be the attitude of most members.

It is felt at least that legislation of a constructive character will help to build confidence. Lack of confidence is largely held to be preventing the return of better conditions.

### Reconstruction Bill to Come First

The first bill to be taken up is the Reconstruction Finance Corporation measure proposing a $500,000,000 organization. The capital is to be supplied by the Federal Treasury. The organization will be authorized to issue debentures up to $1,500,000,000. The measure has been modified since it was originally drafted and made more specific as to whom it will lend money. It is reported also that it has been framed so as to meet objections coming from Senator Glass of Virginia and Senator Bulkley of Ohio against letting the corporation's debentures be admitted to rediscount privileges. The measure is held to promise aid to the railroads and it is hoped will encourage the purchase of equipment by carriers. Senator Couzens of Michigan has expressed the view that the Transportation act already covers necessary loans for the railroads, but the administration does not share this view. The measure probably will be the object of considerable debate, but it is believed it will be enacted late in January.

The Senate is expected to act soon on the House bill to increase the capitalization of land banks by $100,000,000. There is some support in the Senate in favor of making the increase $125,000,000. Early action also seems likely on the administration proposal for a system of Home Loan Banks, one in each Federal Reserve district, with a total capitalization of $100,000,000 to support home and farm mortgages. The legislation to provide loans is being looked to as promising strong Government support for banks against embarrassment and to stimulate the position of railroads, whose bonds are expected to be strengthened and thus add to the financial structure of the country. It is understood that the Reconstruction Finance Corporation bill now carries a provision which requires approval of the Interstate Commerce Commission before railroads may borrow from the fund to be set up. The weaker railroads also will have resort to the Railroad Credit Corporation, to be financed by revenue arising from increased surcharges which go into effect on Jan. 4.

### Tax Hearings to Be Held Soon

Hearings on the taxation program probably will be started soon before the House Committee on Ways and Means. It is likely this measure will see much heated discussion and debate and its passage promises to require considerable time. It is generally predicted it will not be enacted before March. There is much opposition to the administration program, which largely partakes of reenactment of the 1924 revenue act. The greatest opposition is directed toward reenactment of sales and so-called nuisance taxes and taxes in lower brackets. The Treasury Department, however, has replied to criticisms that the plan is directed at individuals with small means. It was declared that persons with incomes of $5,000 and less would contribute only $27,000,000 of the proposed increase of $222,000,000 which would come from added income tax. It is the view of the Treasury that it would be impossible to get the needed revenue solely from larger incomes.

Meanwhile the House and Senate Democrats are framing an entirely different program. Its character was denoted when Chairman Collier of the Committee on Ways and Means said the Democrats were not going to lower the exemption. He stated that employment would be the major factor in drafting the taxation program. With other Democrats he is opposed to the administration suggestion that $920,000,000 be raised by July 1, 1933, but thinks it should be spread over a greater length of time. The Democrats generally favor the floating of short term notes by the Treasury, a proposal opposed by the administration. The Democrats also are against the administration suggestion that the taxes be made retroactive.

There is much sentiment toward paring down the Government budget of $3,942,000,000, and Senator Harrison has introduced a resolution for an investigation to cut it down by $300,000,000. There is a sentiment in Congress that the cutting of Federal expenses would hold down taxes and help business, and aid in recovery from the depression.

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## Pipe Freight Rate Order Suspended Until July

WASHINGTON, Dec. 29.—The Interstate Commerce Commission has suspended until July 15, 1932, schedules which propose to prohibit the shipment of iron and steel pipe, in mixed carloads with other iron and steel articles moving on the 32½ per cent rate basis, unless the combined weight of the pipe does not exceed 33⅓ per cent of the entire weight of the shipment. If the pipe exceeds 33⅓ per cent of the entire weight of the mixed carload shipment, the higher fifth class rates will apply, on traffic moving between points in the Southwest, and between points in the Southwest, on the one hand, and points in Southern Official Classification territories, on the other hand.

# Slight Increase in Exports; Imports Highest Since July

WASHINGTON, Dec. 24.—That exports of iron and steel products from the United States in 1931 will fall below 1,000,000 gross tons seems evident. With the outgoing movement in November amounting only to 59,556 tons, the total for the first 11 months was 908,005 tons.

Indications are that exports in 1931 will show a drop of more than 1,000,000 tons under 1930, when they amounted to 1,985,025 tons. And the 1931 total will fall probably below one-third that for 1929, amounting to 3,037,857 tons.

November exports exceeded by only 221 tons those of October; though the average daily movement in November was 1985 tons, against 1914 tons in October.

Imports in November rose to 34,658 tons from 29,401 tons in October, an increase of 5257 tons. In the first 11 months, incoming shipments in 1931 decreased to 394,448 tons from 496,737 tons in 1930, a decline of 102,289 tons.

The largest export movement in November was in tin plate, 6528 tons, of which Japan took 1107 tons; Argentina, 1086 tons; and China, 770 tons. Exports of steel bars totaled 5590 tons, of which the United Kingdom took 3893 tons and Canada, 698 tons.

Total exports to Canada were 18,215 tons; to the United Kingdom, 6880 tons; and to Japan, 6751 tons.

For the first time in a long period, Belgium yielded first place as the source of imports, Germany leading with 7548 tons, including 1711 tons of barbed wire, 1470 tons of hoops and bands, 983 tons of structural shapes, 977 tons of "other" pipe and 220 tons of reinforcement bars. The Belgian total of 7051 tons included 1905 tons of merchant bars, 1847 tons of structural steel and 1110 tons of ingots, and a total of 896 tons of reinforcement bars.

Canada supplied 5111 tons, which included 2141 tons of ferromanganese and 1274 tons of pig iron. Total imports of ferromanganese were 3770 tons, of which 1319 tons came from Norway. Of the 8716 tons of manganese ore imported, 7676 tons came from Soviet Russia and 1040 tons from India.

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**Exports of Iron and Steel from the United States**
(In Gross Tons)

| | November | | 11 Months Ended November | |
|---|---|---|---|---|
| | 1931 | 1930 | 1931 | 1930 |
| Pig iron | 717 | 565 | 6,313 | 13,197 |
| Ferromanganese | 2 | 51 | 1,253 | 6,189 |
| Scrap | 6,158 | 8,167 | 129,927 | 347,334 |
| *Pig iron, ferroalloys and scrap* | *6,877* | *8,783* | *137,493* | *366,720* |
| Ingots, blooms, billets, sheet bar | 4,299 | 1,166 | 7,873 | 16,713 |
| Skelp | 2,201 | 10,825 | 54,231 | 116,636 |
| Wire rods | 1,353 | 2,543 | 29,912 | 36,764 |
| *Semi-finished steel* | *7,853* | *14,534* | *92,016* | *170,113* |
| Steel bars | 5,590 | 3,350 | 39,908 | 78,158 |
| Alloy steel bars | 136 | 244 | 2,880 | 6,233 |
| Iron bars | 48 | 91 | 986 | 1,695 |
| Plates, iron and steel | 1,407 | 6,743 | 41,256 | 93,943 |
| Sheets, galvanized steel | 1,993 | 6,270 | 44,719 | 82,423 |
| Sheets, galvanized iron | 131 | 426 | 4,032 | 6,034 |
| Sheets, black steel | 5,263 | 11,651 | 80,893 | 118,830 |
| Sheets, black iron | 217 | 868 | 5,152 | 10,768 |
| Hoops, bands, strip steel | 1,275 | 2,125 | 26,617 | 37,492 |
| Tin plate; terne plate | 6,528 | 13,052 | 78,729 | 207,327 |
| Structural shapes, plain material | 3,457 | 8,579 | 85,693 | 132,900 |
| Structural material, fabricated | 1,891 | 6,414 | 29,138 | 97,009 |
| Tanks, steel | 1,064 | 4,167 | 11,940 | 19,627 |
| Steel rails | 2,214 | 3,339 | 29,281 | 92,681 |
| Rail fastenings, switches, frogs, etc. | 1,240 | 1,556 | 7,707 | 18,432 |
| Boiler tubes | 335 | 900 | 6,725 | 13,920 |
| Casing and oil-line pipe | 717 | 2,533 | 20,930 | 57,944 |
| Pipe, black and galvanized, welded steel | 5,330 | 4,264 | 51,310 | 74,817 |
| Pipe, black and galvanized, welded iron | 262 | 445 | 5,019 | 13,737 |
| Plain wire | 1,241 | 1,983 | 13,161 | 24,782 |
| Barbed wire and woven wire fencing | 1,051 | 2,473 | 22,182 | 37,271 |
| Wire cloth and screening | 49 | 81 | 1,179 | 1,492 |
| Wire rope | 74 | 227 | 2,319 | 4,266 |
| Wire nails | 618 | 781 | 7,677 | 7,860 |
| Other nails and tacks | 214 | 240 | 2,461 | 5,272 |
| Horseshoes | 8 | 15 | 148 | 175 |
| Bolts, nuts, rivets and washers, except track | 261 | 533 | 4,572 | 9,438 |
| *Rolled and finished steel* | *12,611* | *33,350* | *627,614* | *1,254,633* |
| Cast iron pipe and fittings | 335 | 1,787 | 19,808 | 29,416 |
| Malleable iron screwed fittings | 225 | 816 | 4,258 | 9,840 |
| Car wheels and axles | 220 | 586 | 5,812 | 13,614 |
| Iron castings | 323 | 391 | 4,086 | 6,024 |
| Steel castings | 55 | 465 | 3,040 | 9,066 |
| Forgings | 641 | 555 | 7,087 | 7,881 |
| *Castings and forgings* | *1,799* | *4,600* | *44,091* | *75,841* |
| All other | 413 | 712 | 6,791 | 12,586 |
| Total | 59,556 | 111,979 | 908,005 | 1,879,993 |

**Imports of Iron and Steel Products into the United States**
(In Gross Tons)

| | November | | 11 Months Ended November | |
|---|---|---|---|---|
| | 1931 | 1930 | 1931 | 1930 |
| Pig iron | 8,805 | 18,292 | 83,415 | 123,241 |
| Sponge iron | | | 210 | |
| Ferromanganese and spiegeleisen* | 2,770 | 2,865 | 24,992 | 50,484 |
| Ferrochrome† | | | 36 | 162 |
| Ferrosilicon‡ | 46 | 21 | 689 | 4,352 |
| Other ferroalloys | 100 | 377 | 1,675 | 687 |
| Scrap | 953 | 1,390 | 15,933 | 26,260 |
| *Pig iron, ferroalloys and scrap* | *13,654* | *22,945* | *127,040* | *205,186* |
| Steel ingots, blooms, billets, etc. | 1,866 | 2,162 | 17,626 | 20,789 |
| Wire rods | 624 | 582 | 6,452 | 8,158 |
| *Semi-finished steel* | *2,490* | *2,744* | *24,078* | *28,947* |
| Concrete reinforcem't bars | 1,597 | 1,492 | 36,798 | |
| Hollow bar and drill steel | 31 | 73 | 1,425 | 41,134 |
| Merchant steel bars | 2,949 | 3,063 | 45,499 | |
| Iron bars | 10 | 75 | 780 | 1,173 |
| Iron slabs | | | 40 | |
| Boiler and other plate | 1 | 101 | 732 | 1,893 |
| Sheets, skelp and saw plate | 274 | 1,711 | 15,918 | 24,512 |
| Tin plate | 30 | 24 | 179 | 254 |
| Structural shapes | 3,703 | 4,068 | 65,762 | 115,294 |
| Sheet piling | | 287 | 919 | |
| Rails and rail fastenings | 82 | 558 | 4,724 | 8,224 |
| Welded pipe | 1,098 | 808 | 7,364 | 6,007 |
| Other pipe | 1,109 | 1,162 | 7,861 | 13,678 |
| Barbed wire | 2,072 | 279 | 8,939 | 4,297 |
| Round iron and steel wire | 202 | 216 | 2,435 | 4,119 |
| Flat wire and strip steel | 39 | 37 | 625 | 1,057 |
| Wire rope and strand | 177 | 198 | 1,868 | 2,416 |
| Other wire | 24 | 6 | 548 | 382 |
| Hoops and bands | 4,374 | 1,587 | 23,742 | 21,280 |
| Nails, tacks and staples | 369 | 711 | 7,818 | 5,534 |
| Bolts, nuts and rivets | 92 | 7 | 915 | 311 |
| Other finished steel | 5 | | 196 | 15 |
| *Rolled and finished steel* | *18,268* | *16,464* | *245,927* | *251,580* |
| Cast iron pipe and fittings | 145 | 841 | 6,621 | 9,985 |
| Castings and forgings | 101 | 105 | 1,712 | 1,439 |
| Total | 34,658 | 43,098 | 394,448 | 496,737 |
| Manganese ore* | 8,716 | 43,095 | 237,452 | 252,587 |
| Iron ore | 94,125 | 10,378 | 1,375,861 | 2,598,204 |
| Magnesite (dead burned) | | 4,052 | 34,276 | 38,148 |

*Manganese content only.
†Chromium content only.
‡Silicon content only.

## Federal 10-Year Building Plan Cut to Three Years

WASHINGTON, Dec. 22.—The Federal 10-year plan for public construction has been so expedited that the term of its completion has been reduced to about three years. The Committee on Program of Federal Public Works, in a report submitted to Walter S. Gifford, director of the President's Organization on Unemployment Relief, says that work is now under way on 596 projects to cost almost $400,000,000. No recommendations are made for additional appropriations for buildings.

The committee expresses the opinion that the Federal road appropriation of $125,000,000 should not be increased, but believes that discretionary authority over the allocation of appropriations should exist. Finally, the committee believes that suggestions to give or lend Federal funds to municipalities or States for public works are unsound in principle. The committee says that experience shows the claim that vast appropriations for public works will relieve unemployment during the present winter is untenable. It points out that it is erroneous to believe that labor can be shifted readily from normal to emergency construction, or moved from home surroundings to new localities.

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## Iron Ore Imports Up in November

Imports of iron ore into the United States in November are reported by the Department of Commerce at 94,125 gross tons, an increase of 34 per cent over the 70,022 tons in October, but otherwise, with one exception, the smallest month's total in the year. It compares with 73,999 tons in November, 1930. It is necessary to go back to September, 1925, to find another smaller total and, preceding that, to November, 1923.

Imports in the 11 months made a total of 1,375,861 tons, a reduction of 47 per cent from that of the same period in 1930.

As has been the case for some time, Chile was the largest supplier both in November and in the 11 months, having furnished almost one-half of the total in November and more than one-half in the 11 months. Sweden was second in November, with Russia third and French Africa fourth.

In the 11-month period Russia was the only important source of suppiy to show an increase. Imports from Chile in that period were cut in half, as were those from Cuba and Sweden. Those from French Africa were only one-third as great as in the preceding year, while imports from Spain declined almost half.

SOURCES OF AMERICAN IMPORTS OF IRON ORE
(In Gross Tons)

| | November | | 11 Months Ended November | |
|---|---|---|---|---|
| | 1931 | 1930 | 1931 | 1930 |
| Chile | 45,276 | 41,338 | 728,063 | 1,581,788 |
| Cuba | | | 78,000 | 190,654 |
| Spain | | 434 | 38,191 | 74,512 |
| Sweden | 25,532 | 6,606 | 83,554 | 193,722 |
| French Africa | 5,300 | | 70,172 | 218,375 |
| Canada | | | 584 | 295 |
| Russia | 17,756 | 8,729 | 255,062 | 237,746 |
| Other countries | 261 | 16,892 | 121,935 | 101,012 |
| Total | 94,125 | 73,999 | 1,375,861 | 2,598,204 |

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## Mill Machinery Builders Have Had Good Year

"The heavy mill machinery manufacturers, with the cooperation of the steel and non-ferrous metal industries, carried through 1931 the progress of development of new equipment which has been a feature of recent years," said George T. Ladd, president, United Engineering & Foundry Co., Pittsburgh, in reviewing the year's progress.

"The fact that this development will continue with the dawn of 1932 is one of the most optimistic prophesies that can be made for both the machinery manufacturers and the industries which they serve. New and improved machinery to be purchased in 1932 will continue to be largely for replacement purposes, reflecting new developments in rolling of materials. Little is heard of sizable proposals for pure expansion purposes as compared with other years."

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## Fabricated Steel Plate Orders Off in November

WASHINGTON, Dec. 29.—Orders for fabricated steel plate in November totaled 18,268 net tons, according to reports received by the Bureau of the Census from 51 manufacturers, and represented a decline of 2571 tons from October. The November bookings were distributed, in tons, as follows: Oil storage tanks, 1755; refinery materials and equipment, 642; tank cars, 98; gas holders, 314; blast furnaces, 314; miscellaneous, 15,058.

Orders in the first 11 months of 1931 totaled 286,268 tons, against 442,648 tons in the corresponding period of 1930.

## Higher Freight Rates to Take Effect Jan. 4

WASHINGTON, Dec. 29.—Rail rates on all shipments of manufactured iron and steel products will be increased 2c. per 100 lb. on Jan. 4. Rates on iron ore, steel mill scale and coal will be increased 6c. a net ton and on pig iron and scrap they will be advanced 12c. a ton.

These higher rates are a part of the surcharges permitted by the Interstate Commerce Commission in the 15 per cent case decision. They will be put into effect through a master tariff which the commission has authorized the railroads to file on short notice. The carriers had hoped to make the rates effective Jan. 1, but found the working out of details could not be completed by that time.

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## Fabricated Steel Orders Lower in November

WASHINGTON, Dec. 29.—Bookings in November of fabricated structural steel reported to the Bureau of the Census totaled 78,579 tons, against 99,173 in October.

In the first 11 months of 1931 reported orders were 1,596,321 tons, compared with 2,232,715 tons in the corresponding period of 1930. Computed orders in November were 87,200 tons, or 21.8 per cent of the country's total capacity, against 110,000 tons, or 27.5 per cent of capacity in October.

Estimated bookings in the first 11 months of 1931 totaled 1,805,600 tons, or 41 per cent of capacity, against 2,536,800 tons, or 57.7 per cent of capacity in the corresponding period of 1930.

Shipments reported for November were 81,885 tons, compared with 106,569 tons in October. In the first 11 months of 1931 they were 1,227,769 tons, against 1,999,338 tons in the corresponding period of the preceding year. Estimated shipments in November were 111,600 tons, against 145,600 tons in October, representing 27.9 and 36.4 per cent of capacity, respectively.

In the first 11 months of 1931 estimated shipments were 1,716,000 tons, or 39 per cent of capacity, against 2,818,800 tons, or 64.1 per cent of capacity, in the first 11 months of 1930.

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United States Engineer Office, Kansas City, Mo., asks bids until Jan. 4 for 20 steel pontoons with pivot bearing pipe carriers, 20 sections electric welded 34-in. steel pipe with steel flanges, four cast steel elbows, wrought steel nipples, deflector plates, etc. Bids soon to be asked for construction of two self-propelled sternwheel dredges, each 200 ft. long, cutter type, for St. Louis district.

# ....OFF THE ASSEMBLY LINE....

# New Models for Automobile Show Absorb Detroit's Attention

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DETROIT, Dec. 28.

WITH the New York automobile show less than two weeks away, Detroit is in a flurry of excitement. Actual production of motor cars is still at a low level, but factory executives are abnormally busy getting their operating lines attuned to 1932 changes. Never in recent years has the industry gone into show month with so few cars in stock. It is estimated that domestic retail dealers now have on hand only 100,000 cars, or about 2½ per dealer. Retail sales in November and December exceeded output by a considerable margin, so that it is believed that the year's total performance will reveal that passenger car sales were about 100,000 units ahead of production. This illustrates how conservatively the factories have operated during the past 12 months.

Automobile manufacturers are not optimistic about the January outlook for either retail demand or factory assemblies. Next month should show a gain over the 100,000 cars which it is believed the industry turned out in December, but it is likely to be of modest proportions. Just how rapidly improvement will be during the first quarter depends on two factors—the inclination of the public to purchase cars and the speed with which the Ford Motor Co. gets into action. There is no denying the fact that the promise of an eight-cylinder Ford is disturbing to competitors and probably will have a retarding effect on sales in the low-price field until it is publicly announced.

Murray and Briggs are now shipping 2000 new Ford bodies to Ford's branch assembly plants, while parts for a similar number of new cars are being produced at the Rouge works of the Ford company. It is understood that Ford may display a limited number of new models at show time.

Apparently it is the present intention of the Ford company to put on the market a chassis capable of taking either a four-cylinder or an eight-cylinder motor. It is understood that the eight will be stressed in the company's merchandising efforts. This car will be sold somewhere near the level of model A. For commercial cars the four-cylinder motor will be used exclusively.

**December motor car output estimated at 100,000 units. Modest gain expected in January.**

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**Domestic passenger car sales this year expected to exceed production by a considerable margin. Stocks now in dealers' hands average only 2½ cars per dealer.**

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**Several manufacturers have adopted cast iron pistons plated with tin. Trend noted toward centrifugally cast iron brake drums with steel jacket.**

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With the exception of intermittent rolling operations, the Ford steel mills continue idle. There is no indication of plans for resumption of open-hearth activities in the immediate future.

### Pontiac to Offer an Eight

Pontiac is expanding its line to include both a six and a V-type eight, which will be announced early the coming month. Synchromesh transmission, with quiet second gear and built-in free wheeling, will be featured. Oldsmobile will present a six and an eight, using the same chassis. The eight will cost $100 more than the six. Auburn is said to be preparing a new mechanical improvement to be called "dual ratio." By turning a lever on the instrument board, the driver can change the gear ratio of his car, making it a car for hills or flat country as desired. This makes it practical to operate one axle which produces a high or low axle ratio. It is claimed that dual ratio results in decreased noise, saving in fuel and elimination of vibration. Auburn, incidentally, will have both an eight and a twelve.

Cadillac Motor Car Co. is continuing for 1932 its full line: LaSalle eight and Cadillac V-eight, V-12 and V-16. All four series have synchromesh transmission and controlled free wheeling. All forward gears, including low gear, are of the constant mesh, helical type. A high compression engine is optional equipment on the Cadillac eight. All cars have a six-point rubber-cushioned engine suspension, air-cooled fuel line and heavier frames. Pistons are of molybdenum cast iron plated with tin. Both the LaSalle and Cadillac V-eight now have molybdenum cast iron brake drums made by the electric furnace process. Heretofore this type of brake drum was used only on the V-12 and V-16. Bodies of all cars are conservatively stream-lined.

### Hupmobile Eight Has Radical Body Design

From the standpoint of aerodynamic design, the most radical car of the year, with the exception of the Graham, is Hupmobile eight. It offers free wheeling, a synchro-silent transmission, longer wheelbase, thermostatically-controlled shock absorbers, X-type frame and chassis torsional stabilizer. The treatment of the front end of the Hupmobile six is more conservative than that of the eight.

The new Chrysler cars will have Oilite springs. The company's engineers have designed and patented this spring based on the use of Oilite metal, which is 40 per cent oil by volume.

# ...OBITUARY...

WILLIAM McLAUCHLAN, for many years a partner in Pickands, Mather & Co., Cleveland, until his retirement in 1918, and connected with that firm for 35 years, died at his home in that city Dec. 22, aged 81 years. He had been in poor health for some time and for several weeks had been confined to his bed. Born in Cleveland, of Scotch immigrant parents, Mr. McLauchlan started life as a newsboy and rose to a high position in the iron and steel industry, in which he was widely known and greatly respected. Possessing a most agreeable personality, he won the friendship and high esteem of all with whom he came in contact. After his education in the Cleveland public schools, he entered the Lake shipping business in 1873 with the Cleveland Iron Mining Co. In 1883, when Pickands, Mather & Co. was formed by Col. James Pickands, Samuel Mather and Jay C. Morse, Mr. McLauchlan became an employee of that firm. Winning recognition for his ability as a pig iron salesman, he later was placed in charge of the firm's pig iron and ore department, of which he served as the head for many years. As a tribute to the esteem in which he was held by his associates in the firm, one of the largest freighters of the Interlake Steamship Co. was named for Mr. McLauchlan. This was launched in 1926, eight years after he had retired from the partnership. At his retirement, Mr. McLauchlan was succeeded as a member of the firm by Jay Chandler McLauchlan, who died in 1929.

WILLIAM McLAUCHLAN

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ALONZO ALDRICH, one of the founders and for 42 years president of the Beloit Iron Works, Beloit, Wis., pioneer manufacturer of paper and pulp mill machinery, died from a heart attack in his hotel suite at Cleveland on Dec. 20, while on a business trip. He was born March 15, 1858, at Logansport, Ind., and became a resident of Beloit at an early age. Following his graduation from the University of Illinois, he became associated with the former Merrill & Houston Co., Beloit, and in 1885 directed its reorganization into the present company, of which he became president in 1889.

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WILLIAM A. YOUNG, consulting engineer, Harnischfeger Corpn., Milwaukee, died Dec. 24, after a brief illness. He was 61 years of age and had been connected with the Harnischfeger Corpn. and its predecessor, the Pawling & Harnischfeger Co., for 20 years. He had retired several years ago as chief engineer to become a consultant.

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THOMAS W. DAWSON, vice-president of the H. C. Frick Coke Co., Pittsburgh, died at his country home near Scottdale, Pa., on Dec. 19. He was born at Helfenstein, Pa., in 1876, and had been identified with the Frick company for 25 years, having served as chief engineer, with headquarters at Scottdale during a great part of that time.

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JOSEPH A. SIMONTON, for a number of years engaged in the steel brokerage business at Pittsburgh and for a time representative of the Fitzsimons Co., Youngstown, died on Dec. 20 at his home in Aspinwall, Pa. He was 71 years of age, and, prior to setting up his own business, had been identified for a time with the Carnegie Steel Co., Pittsburgh, and with the Union Drawn Steel Co., Beaver Falls, Pa.

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JENKIN BRYNMOR HILL, closely connected with the Grovesend Sheet & Tin Plate Co., Glamorgan, and Richard Thomas & Co., Ltd., Llanelly, Wales, died Dec. 16. He was a leading figure in the South Wales tin plate industry.

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J. E. KINDREGAN, president, J. E. Kindregan & Co., New York, died in a railroad accident Dec. 23. He was 40 years of age and for the past 10 years had headed his own company, which deals in iron and steel for dock and pier construction. Previously he had been Eastern sales manager for the Phoenix Iron Works, Meadville, Pa., now the Mead-Penn Iron Works Co.

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HORACE W. LASH, for the past 15 years president of the Pacific Forge & Iron Co., San Francisco, died there recently, aged 74 years. A native of western Pennsylvania, he received his first training with the Otis Steel Co. under S. T. Wellman. Later he was with the Cleveland Rolling Mill Co., in charge of the open-hearth department, and after several years in Europe spent in studying methods of steel making he returned with Park Brothers & Co. The plant of the Carbon Steel Co. was built under his direction. Before moving to the Pacific Coast in 1901, he was a partner in the Garrett-Cromwell Engineering Co. In the far West, Mr. Lash formed the West Coast Iron Co. in 1914. He was president of the company when it was purchased by the Pacific Coast Steel Co. in 1918.

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HENRY H. BARBOUR, who was vice-president of the Lackawanna Steel Co., Buffalo, prior to its purchase by the Bethlehem Steel Corpn. in 1923, died in Philadelphia on Dec. 28 at the age of 70. He had been ill for a long period. Up to the time of his retirement some years ago, Mr. Barbour had spent most of his adult life in the steel business. He was graduated from the University of Illinois as a civil engineer, and in 1893 entered the sales department of the Carnegie Steel Co. He continued in that position until 1901, when he was appointed to the managership of the steel department of the George A. Fuller Co., New York, where he remained until 1904, when he entered the sales department of Lackawanna Steel Co., of which he became New York district sales agent in 1911. During the World War he was a member of the Priorities Committee of the War Industries Board at Washington. After the war he was made a vice-president of the Consolidated Steel Corpn., an export selling organization representing independent steel companies, which later was dissolved. He was then elected a vice-president of the Lackawanna Steel Co. and made his headquarters in Buffalo.

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Bureau of Labor Statistics will begin in January the publication of a revised wholesale price index, to be issued weekly as well as monthly. The new wholesale price index carries 784 price entries, instead of 550 as heretofore. Most of the additional items are fully manufactured commodities, or so-called "consumer goods."

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Orders were placed in November for 104 electric hoists, valued at $48,243, against 165, valued at $71,451 in October, according to reports made to the Bureau of the Census by 13 manufacturers. Orders in 11 months totaled 2386 hoists, against 3799 in the corresponding period of 1930.

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The Navy Department has sold the old cruiser Pittsburgh to the Union Shipbuilding Co., Baltimore, for $53,588.

# ... PERSONALS ...

CHARLES P. WHITEHEAD, since May, 1930, sales assistant to the vice-president and general manager of the Commonwealth division of the General Steel Castings Corpn., Philadelphia, has been appointed manager of sales with general supervision of the entire sales organization. He will make his headquarters at Eddystone, Pa. HARRY R. BARTELL has become manager of Western district sales, with headquarters at Granite City, Ill. He has been identified with the Commonwealth Steel Co. since 1916, successively as chief estimator, mechanical engineer and sales engineer. WILLIAM M. SHEEHAN continues as manager of Eastern district sales. G. FRED DRIEMEYER, who, upon his return from Paris last July as director in Europe of the Commonwealth Sales Corpn., was appointed sales engineer of the General Steel Castings Corpn., covering the Chicago district, will also continue to represent the Commonwealth Sales Corpn. at the Granite City office.

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ADOLPH W. GILBERT, for more than 20 years president of the Chapman Valve Mfg. Co., Springfield, Mass., has resigned. He has been succeeded by THOMAS F. MAHER, formerly sales manager and vice-president. Mr. Gilbert went with the Springfield company in 1909 from the Pratt & Cady Co., Hartford, Conn., of which he was president and general manager.

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GEORGE R. FINK, president, Great Lakes Steel Corpn., Detroit, has been appointed a member of the executive committee of the Guardian Detroit Union Group, Inc., Detroit, a banking organization consisting of several large Detroit banks and affiliated institutions in smaller Michigan cities.

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H. S. KIMBALL has been made vice-president and a member of the board of the Illinois Zinc Co., Chicago. He was formerly president of the American Zinc, Lead & Smelting Co. and more recently president of the Remington Arms Co.

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LOUIS E. STONER, since 1918 president of the Jacobs Mfg. Co., Hartford, Conn., and identified with the company since 1903, has been elected chairman of the board. HUBERT M. TOPPIN, heretofore secretary-treasurer, has been made president and continues as treasurer, and GUSTAVE A. ENGLUND, in charge of manufacturing activities for the past 18 years, has become first vice-president and factory manager. JOSEPH H. HAZLEY, who has served the company as sales manager since 1918, has been made vice-president also. ALBERT E. ENGLUND, who has been with the company for a number of years, has been appointed production manager.

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GLEN F. HAWKEY, for the past 14 years associated with the Cleveland Duplex Machinery Co., Inc., Cleveland, has been elected vice-president. R. H. BALL, who has been identified with the Warner & Swasey Co. for a number of years, has become affiliated with the Cleveland Duplex Machinery Co. as sales engineer.

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FRED MIICK, who has been in the engineering and sales departments of the Philadelphia plant of the Link-Belt Co. for the past 21 years, has been appointed engineer in charge of sewage treatment plant equipment sold on the Pacific Coast by Link-Belt. He will make his headquarters at 400 Paul Avenue, San Francisco.

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JOHN U. ANDERSON, formerly treasurer of the Republic Steel Corpn., has assumed new duties as secretary-treasurer of the National Fireproofing Co., Pittsburgh. Mr. Anderson was for many years treasurer of the Trumbull Steel Co., Warren, Ohio, and became treasurer of Republic in 1928, when that company absorbed the Warren property. In the summer of 1931 Mr. Anderson resigned from the Republic company to become president of the Union Savings & Trust Co., Warren.

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ERIC L. BERGLAND, formerly associated with the General Motors Corpn. and E. I. du Pont de Nemours & Co., Inc., has been made president of the American Pneumatic Service Co. and its subsidiary, the Lamson Co.

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A. W. ROBERTSON, chairman of the board of the Westinghouse Electric & Mfg. Co., East Pittsburgh, has returned from a six weeks' tour of Europe, which he devoted largely to a study of international business conditions. In commenting upon the situation, Mr. Robertson pointed out that "it is becoming clearer that America is inextricably connected with the rest of the world in the depression."

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EVERETT J. COLE, formerly chief chemist of the Hilo Varnish Mfg. Co., 42 Stewart Avenue, Brooklyn, N. Y., has been appointed industrial sales manager of the company.

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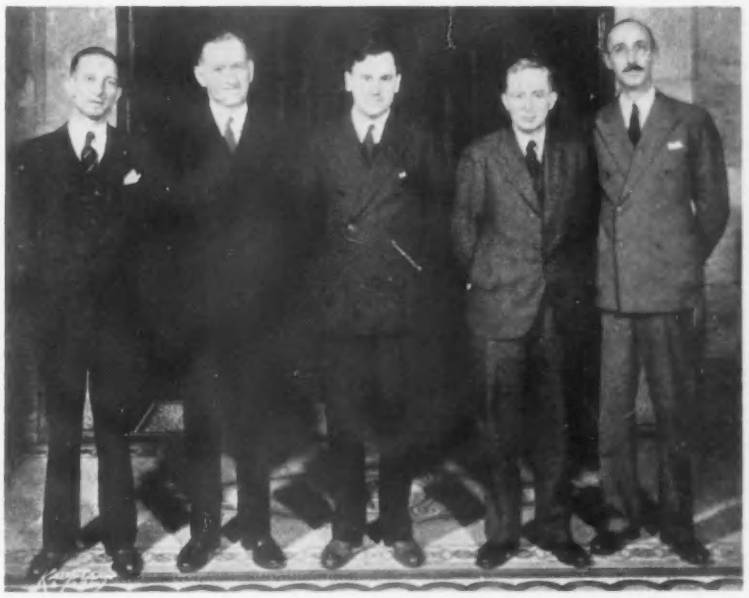
HENRY A. TAUBENSEE has been made Chicago district sales agent, with office at 400 West Madison Street, for the Newton Steel Co., Detroit.

## NEW OFFICERS OF THE INTERNATIONAL ACETYLENE ASSOCIATION

(Left to right) H. F. Reinhard, chief engineer, J. B. Colt Co., New York, secretary; E. J. Hayden, Linde Air Products Co., Chicago, vice-president; W. C. Keeley, Jr., vice-president, National Carbide Corpn., New York, president; W. D. Flannery, Harris Calorific Sales Co., New York, retiring president; and W. C. Cotter, Oxweld Railroad Service Co., New York, treasurer.



W. W. MACON
*Editor*

# ..THE IRON AGE..

A. I. FINDLEY
*Editor Emeritus*

(ESTABLISHED 1855)

## Hope Centered on 1932

WITH the passing of 1931, the business world will experience at least a psychological change for the better. There will be a sense of great relief that a year of such severe trials has become history. The outlook immediately becomes brighter, not so much because of any highly encouraging prospects on the horizon, but chiefly because the new year can be faced with the comforting assurance that it must inevitably be better than the old, for it could scarcely be worse without bringing complete economic collapse, which few, if any, believe would be allowed to happen.

The patient is still in a state of early convalescence, but the environment is much improved merely by a change in the calendar, and the minds of men everywhere will change with it, and this, in itself, bears some promise.

Moreover, concrete progress is being made and will continue to be made within the coming months toward economic stability, which must precede any marked improvement in industry and business generally. At no time within the past several months of dark forebodings has the rift in the clouds seemed quite so discernible.

In the field of international economics the meeting of nations called for Jan. 18 to discuss war debts and reparations promises a definite step toward resolving this great problem. If world recovery must precede any marked betterment in the United States, as many believe, it would seem that a proper beginning is in action upon the recommendations of the experts at Basle.

In our own domestic affairs we are justified in the hope that economic relief measures being worked out by President Hoover and Congress will go a long way toward restoring confidence and easing credits. Hope is strong that the railroad problem, perhaps the most serious of our internal affairs, is working toward at least a partial solution. Wage reductions, now generally expected, together with higher freight rates and the credits that will become available to the carriers through the President's Reconstruction Finance Corporation, will help to put the railroads into the markets as buyers again, and will lift the values of railroad bonds, a process, in fact, that has already begun.

No one can safely predict when such restorative influences will bring a real upturn in business, but there is good reason to believe that at some period in 1932 we shall be able to see definite improvement.

Industry has done a thorough house-cleaning job in 1931, and should be better able in 1932 to make profits, even assuming a volume of business very much below that which has hitherto been considered as normal.

## Placing Patriotism Before Politics

IN a situation such as that confronting the nation today personalities and politics have no place. The American public is not looking for miracles; nor is it now interested in post-mortems. What it demands is that prompt action be taken to meet present emergencies.

A number of emergency measures have been submitted to Congress by the President. The most important relates to the creation of a Reconstruction Finance Corporation to relieve strains in our economic structure which cannot be reached through other means.

The least that can be expected from the legislative branch of our Government is expeditious, sincere and whole-hearted consideration of these proposals, regardless of political considerations. It is time to place patriotism before party.

## Sheets Do Relatively Well

ASSUMING that the monthly reports of sheet production by independents have been as close an indication of total production of the sheet industry as they have been in the past, total production of sheets in 1931 will prove to be almost precisely 2,500,000 gross tons. It is assumed that December production will be equal to that of November, quite justifiable since even a 10 per cent variation would change the estimate for the year by only 13,000 tons.

The proportion of sheet production to total finished rolled steel will accordingly be in the neighborhood of 13½ per cent, which compares with 12 per cent in 1930 and 12 to 13 per cent in preceding years. This 1931 increase in the sheet proportion is scarcely what would have been expected in view of the conspicuously light demand of several important lines of sheet consumption much in the public eye.

While the number of automobiles and trucks produced in 1931 has been in only slightly lower proportion to total steel production than the average of the three preceding years, it is the common view that the average weight of car so decreased as to reduce very materially the proportion of tonnage actually taken by the automobile industry. Building, which

ordinarily involves much sheet consumption, has been conspicuously light, while there has been very little box car building and repair. The farm implement industry has no small use for sheets and has been conspicuously dull, while it may be assumed that sheet consumption on farms was relatively light.

It is true there are other sheet-consuming lines that have done quite well relative to the general field of industry. Metal furniture was decidedly active in the first half of the year and has not been so very dull of late. Barrels and drums have done distinctly well, while there has been a heavy demand for culverts in connection with road building.

These are about the only large lines of sheet consumption that can be cited as having done relatively well, and the credits they furnish are hardly sufficient to offset the debits referred to. The net favorable balance, with sheets in 1931 constituting a higher proportion of all steel made than ever before, apparently has to be explained by numerous individually small lines of sheet consumption faring better than industry in general or the steel industry, as a whole, in particular.

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## Current Futilities

IT is futile to discuss the alleged advantages of short selling in normal times. What concerns us today is whether short selling accentuates stock market demoralization during a period when prices have no relation to real values.

It is futile to dismiss the wholesale closing of banks with the statement that they deserved their fate. The practical question of the day is what, if anything, can be done to protect the savings of millions of innocent depositors.

It is futile to criticize the record of the Interstate Commerce Commission. Our present concern is whether prompt relief can be given to an endangered transportation system.

It is futile to argue the merits of the moratorium. Our current need is to reconcile ourselves to a continuance of the moratorium so long as the depression remains acute.

It is futile to uphold the advantages of the gold standard. Our present problem is to hold our trade with the many countries that have left that standard.

It is futile to fear a general economic collapse. No collapse could last long. The necessity for exchanging goods and services so that people may live is not changed by the degree of hysteria that may prevail.

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IN the trying times of the next several months management will face no small task to foster the good labor relations that have marked industry for some years. The wide preachments of the importance of the buying power of wages and greater participation by employees in the financial side of the business have been factors in the good feeling, but latterly it is the sincere effort to maintain employment that has contributed to the good feeling. A major problem for management now will lie in provision for continuity of employment. Thus security of the job will be a greater concern with the employer than has generally been the case, and this item will take its place along with those of good working conditions and good tools as requirements to be met on the side of management.

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## ▲ ▲ ▲ CORRESPONDENCE ▲ ▲ ▲

### Reflections of a Consumer

*To the Editor:* I am one of many millions living in the country, doing some farming, more or less construction and upkeep, supporting a family and numerous dependents and employees, and am in general typical of many thousands of consumers in the United States. I need add only that my situation is in the northeastern corner of Massachusetts. Deliveries to us are mainly by rail, but a few commodities come by water and subordinately by truck.

*Gasoline.*—We use about 3000 gal. a year and have tankage for about 400 gal. One of the great refining companies keeps us filled. I have just paid a bill at the rate of 12.9c. a gal., less 2c. dealers discount, making the net cost 10.9c. This includes the State tax of 3c., so the refining company realizes 7.9c. and delivers the gasoline to me. At this time the bulk price for high grade gasoline is 7c. at Atlantic seaboard points. The refinery price for this grade of gasoline is about 4.9c. The refiner obviously does a great deal of work for small margins. In our territory the price for gasoline is lower than the average, the service-station price in 163 cities having been 12.856c., exclusive of State tax, at this time.

*Cement.*—In the course of a year we may use 100 bags of cement, purchased from a local dealer in lots of 10 to 20 bags at a time. In 1929 the price was 75c. a bag delivered to us. In 1931 it has been 65c. There are four bags to the barrel, so the price to us has come down 40c. a barrel. The price f.o.b. mills has come down from $1.40 to $1 a bbl., so the saving to us is just what has come out of the producer. Freight and distributing charges remain unchanged. In so far as we are concerned I can not see that the difference between 75c. and 65c. a bag increases our consumption. Within that range we do not think of the price at all. It is only a question whether we need cement or do not. On large jobs I suppose there might be other thoughts.

*Electrical.*—We have just built a mile of pole line to bring current into the poultry farm. The cheap price for copper did not enter into the consideration in any way, nor that of other materials—poles, galvanized hardware, insulators, etc. The quantity of copper in wire is insignificant, but when we consider transformer, switches, motors, etc., there is probably a respectable poundage. The all-important factor, however, is labor.

*Labor.*—When the town hires common labor to work on the roads and otherwise it pays $4 for eight hours. When the private person hires the same men to do the same kind of work it pays them $3. The latter is not a beggarly wage. Fifteen years ago we paid only $2 and the cost of living was no less then than it is now. However, everybody then did not have an automobile and a radio and did not so frequently go to the movie. The soldiers of our army are fed at a cost of 40c. a day and the thrifty housewife in this district can do about as well as that. Rents are low—$10 a month for a cottage

—and the requirements for clothing are small. Wood, for fuel, is $10 a cord, sawed and delivered. Many of the men keep a few hens and raise some of their food in their gardens.

*Building.*—In the early part of 1929 we committed ourselves to a building project, to be done by a master-builder at cost plus 10 per cent. Let us digress here long enough to say that this was a reliable builder with whom we had done business in this way for many years and it had become our conviction that his 10 per cent was inadequate remuneration for the service he rendered. Just before May 1, 1929, he informed us that the unions had voted themselves an increase of 10 per cent in their wages. The labor cost in our building was about 50 per cent, so this increased our cost about 5 per cent. We had to grin and bear it but we said to ourselves that we'd be hanged if we'd do any more building. A good many other persons were in the same state of mind in 1929. So when their commitments were completed a large number of building mechanics passed into unemployment.

Coincidentally with this my purchases of lumber, nails, cement, tar, and paint and other materials were curtailed. I suppose this is the reason for diminished demand for all such commodities. If you don't build you don't buy, and if the mechanics make it too costly to build you refrain from doing it, even from upkeep work unless it be exigent.

The mechanics in my region are splendid men—all of them. They are of the best types of American citizens. I like to discuss with them the questions of the day, although this is an expensive luxury, considering that a five-minute conversation with a pair at 2c. a minute always costs 20c. (to me).

The first reaction to the diminished demand for their services was the retention of the best men only. As the demand for them diminished their thought was that if they could get only two days of work a week they ought to get more for those days, so that in 1930 they were actually meditating a further advance in the union scale. The idea of reducing rates in order to increase sale of services never entered their heads. In 1930 that might have saved the situation, for our investments were still well quoted, our credit was good, and our courage was high. We had a lot of repair work that we were anxious to do and we were still able to do it.

As 1931 draws near its end the situation is entirely different. Mechanics, union or non-union, are willing to work for anything that they can get, but our investments in industrial companies that produce commodities are quoted at about one-tenth of what they were, our courage, credit and liquidating power have vanished, and the idle mechanics have got to wait until they come back. There is a wealth of work to be done. In 1930 we might have begun it if we had been offered reasonable terms. In 1931 we are unable on any terms. The stupidity of labor killed its own goose and ours too. We hope that in 1932 there will begin to be a restoration of profits in business and then we shall be able to employ carpenters and bricklayers on permissible terms. My chief thought in all of this is what mighty poor salesmen the union leaders have been.

*Galvanizing.*—We use a lot of galvanized iron and steel around the farm. Fencing. Parts of farm machinery. Pole-line hardware. Buckets. Sheets. Lag screws, eyebolts, etc. The zinc protection is not always as durable as we should like to have it. But good or bad there is no doubt that galvanizing is the best protection against the weather that we know for iron and steel. However, if any manufacturer should guarantee us a super-galvanized product we should buy that in preference to anything else. We are all for zinc if we can get it. Skimping may be persuasive to the smart buyers of the mail order houses, but to the ultimate consumer it does not get anywhere. Unfortunately most of the distributers do not know what they are selling. The manufacturers ought to educate them.

MASSACHUSETTS.

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## Heat Absorption by Refractories

(*Concluded from page* 1682)

operation, the fuel required to heat to operating temperature is practically independent of the usual wall construction; during operation the fuel consumption is affected by the refractory design.

2. The calculation is more simple, and the information derived is more valuable as a basis for burner and furnace design, if the fuel for heating up and that for operating are calculated separately.

3. During the operating period, the heat to refractories includes that for both radiation and absorption. The total heat so used hourly decreases as the time increases, until equilibrium is reached, when absorption is complete and all heat supplied represents the minimum and constant value of true radiation.

4. The simple relations between known values of true radiation for common refractory combinations and the average total of absorption and radiation for various operating periods of time can be determined with practical accuracy, and are given in Table VIII. Application of these data to practical calculations of fuel consumption is simple.

5. When a furnace is operated continuously for long periods the refractory lining reaches equilibrium, and the only loss of heat to refractories is then true radiation. In such cases, the heat absorbed by the refractories is of less importance to the fuel economy.

6. Intermittent operation, consistently repeated each day, lowers the average heat required by the refractories, in comparison with a single heat. The ratio of reduction has been experimentally determined for a wall of 13½ in. firebrick and 2½ in. insulation, where the average total of absorption and radiation requirements for a period of six consecutive daily operations of 10 hr. each day has been found to be only 80 per cent as great as the same requirement for the first day, which represents a single heat starting with a cold furnace.

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## Dr. Haney's P/V Line

Through a mistake, the statement was made on Dr. Haney's page last week that the P/V line may indicate that the time for the ascending phase of a business cycle has been reached "without any more correction needed than some steadying in prices." The statement should have read:

Possibly the action of the P/V line is one of several indications that the period of the 40-month business cycle has reached the time when we *should* be well along in the ascending phase, without there actually having been any more correction (of over-supply) than enough to bring a little steadying in prices. This suggests that further reaction is probable as we near the time when the ordinary 40-month cycle would enter the declining phase.

## SUMMARY OF THE WEEK'S BUSINESS

# Steel Operations Gain Moderately; Prices Continue to Decline

### Bars Lower at Pittsburgh, But Chicago Mills Announce $2 a Ton Advance—Automobile Orders Larger—Erie Inquires for Rails

A PARTIAL resumption of steel plant operations has occurred at Pittsburgh, Youngstown and Wheeling, but the Chicago district, which had no sharp curtailment last week, is down to a 15 per cent ingot output, largely offsetting the gains elsewhere. Nevertheless, the average for the country is at 22 per cent of capacity, against 21 per cent last week, and a gain is indicated for the first week of January to approximately the rate in effect prior to the December decline.

Developments relieving an otherwise drab year-end are substantial orders for sheets and strip steel, placed principally with mills at Detroit and Cleveland; increased specifications for bars from farm implement manufacturers in the Chicago district; a rise in fabricated structural steel lettings to 36,000 tons, making it the best week for such contracts since September, and an inquiry from the Erie Railroad for its 1932 rail requirements, estimated at 40,000 tons.

STEEL companies are making an effort to check the decline in prices. Chicago mills have announced an advance of $2 a ton on bars, plates and shapes to 1.70c. a lb., but meanwhile Pittsburgh and Youngstown bar makers have taken business at 1.50c., Pittsburgh, a reflection of the weakness that recently developed in plates and shapes. Outstanding quotations of 1.40c. a lb., Pittsburgh, on shapes have been withdrawn. The aim to reestablish a 1.60c. Pittsburgh base for the heavy hot-rolled products for first quarter has not been abandoned.

Hot-rolled strip steel is being widely offered at 1.45c. a lb., Pittsburgh, for the wide and 1.55c. for the narrow, but automobile companies have obtained prices $1 a ton lower. There is continued weakness in sheets, particularly automobile body stock, and in cold-rolled fender stock, tin mill black plate and long ternes. Recent maximum prices on sheets have virtually disappeared, even on small lots. Semi-finished steel in the form of billets, slabs and sheet bars has been marked down $1 a ton, but the recently announced advances of $2 a ton on wire rods and $1 a ton on some merchant wire products are now in effect and firmly held.

Price declines extend to pig iron, Buffalo producers having reduced quotations $1 a ton for deliveries within that district. Elsewhere, pig iron quotations are fairly steady, though largely untested. Heavy steel scrap has weakened in eastern Pennsylvania, bringing THE IRON AGE scrap composite price, which for some months has been the lowest on record, down to $8.50 a ton.

THE IRON AGE composite price for finished steel is reduced to 2.052c. a lb., against 2.075c. last week. The present level is only $1.04 a net ton above the low point of the 1921-1922 depression, 1.998c. a lb., which was quoted late in February, 1922.

ALTHOUGH steel companies have not been able to accumulate sizable backlogs during the December lull in operations, some tonnage on their books will automatically be released by the change in the calendar, as many consumers and distributers have suspended all shipments until after Jan. 1. A number of rail orders placed in the fall will be rolled. The Ensley rail mill of the United States Steel Corpn. in Alabama will resume next Monday after a shutdown since last July. A blast furnace and several open-hearth furnaces there will also be put into service.

The freight rate advance to go into effect Jan. 4 has stimulated some shipments, but more in pig iron than in steel.

OF the major steel-consuming industries, the automobile makers seem to offer the most promise for early betterment in buying, although their production schedules are being increased so slowly that only a moderate gain in output of cars in January is probable. The Ford Motor Co. is completing 2000 new models for display purposes, and nearby volume production may depend somewhat on their public reception. The General Motors Corpn. has placed its 1932 pig iron contracts, which normally call for about 100,000 tons within a year.

Notwithstanding the rather sharp gain in structural steel awards during the week, the amount of new work coming out for bids was only 11,000 tons. In 11 months of 1931 the computed bookings of fabricated structural steel, as reported by the Bureau of the Census, were only 1,805,600 tons, compared with 2,536,800 tons in the corresponding period of 1930. The November computed bookings were 87,200 tons, or 21.8 per cent of the country's capacity, against an average for the first 10 months of 171,840 tons a month.

# ▲▲▲ A Comparison of Prices ▲▲▲

**Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics**

## Pig Iron

| *Per Gross Ton:* | Dec. 29, 1931 | Dec. 22, 1931 | Dec. 1, 1931 | Dec. 29, 1930 |
|---|---|---|---|---|
| No. 2 fdy., Philadelphia | $15.51 | $15.51 | $15.51 | $17.76 |
| No. 2, Valley furnace | 15.50 | 15.50 | 16.00 | 17.00 |
| No. 2 Southern, Cincinnati | 14.69 | 14.69 | 14.69 | 14.19 |
| No. 2, Birmingham | 12.00 | 12.00 | 12.00 | 14.00 |
| No. 2 foundry, Chicago* | 16.50 | 16.50 | 17.00 | 17.50 |
| Basic, del'd eastern Pa. | 16.25 | 16.25 | 16.25 | 17.75 |
| Basic, Valley furnace | 15.00 | 15.00 | 15.00 | 17.00 |
| Valley Bessemer, del'd P'gh | 17.76 | 17.76 | 18.26 | 19.26 |
| Malleable, Chicago* | 16.50 | 16.50 | 17.00 | 17.50 |
| Malleable, Valley | 16.00 | 16.00 | 16.50 | 17.50 |
| L. S. charcoal, Chicago | 23.04 | 23.04 | 23.04 | 27.04 |
| Ferromanganese, seab'd carlots† | 175.00 | 175.00 | 185.00 | 80.00 |

*The average switching charge for delivery to foundries in the Chicago district is 61c per ton.
†Ferromanganese quotations adjusted to carload unit; larger quantities at discount.

## Rails, Billets, etc.,

| *Per Gross Ton:* | | | | |
|---|---|---|---|---|
| Rails, heavy, at mill | $43.00 | $43.00 | $43.00 | $43.00 |
| Light rails at mill | 34.00 | 34.00 | 34.00 | 36.00 |
| Rerolling billets, Pittsburgh | 28.00 | 29.00 | 29.00 | 30.00 |
| Sheet bars, Pittsburgh | 28.00 | 29.00 | 29.00 | 30.00 |
| Slabs, Pittsburgh | 28.00 | 29.00 | 29.00 | 30.00 |
| Forging billets, Pittsburgh | 35.00 | 35.00 | 35.00 | 36.00 |
| Wire rods, Pittsburgh | **37.00** | 35.00 | 35.00 | 35.00 |
| | Cents | Cents | Cents | Cents |
| Skelp, grvd. steel, P'gh, lb. | 1.50 | 1.50 | 1.60 | 1.60 |

## Finished Steel

| *Per Lb. to Large Buyers:* | Cents | Cents | Cents | Cents |
|---|---|---|---|---|
| Bars, Pittsburgh | 1.50 | 1.60 | 1.60 | 1.60 |
| Bars, Chicago | 1.60 | 1.60 | 1.60 | 1.70 |
| Bars, Cleveland | 1.55 | 1.65 | 1.65 | 1.65 |
| Bars, New York | 1.83 | 1.93 | 1.93 | 1.93 |
| Tank plates, Pittsburgh | 1.50 | 1.50 | 1.60 | 1.60 |
| Tank plates, Chicago | 1.60 | 1.60 | 1.60 | 1.70 |
| Tank plates, New York | 1.78 | 1.78 | 1.83 | 1.88 |
| Structural shapes, Pittsburgh | 1.50 | 1.50 | 1.50 | 1.60 |
| Structural shapes, Chicago | 1.60 | 1.60 | 1.60 | 1.70 |
| Structural shapes, New York | 1.75½ | 1.75½ | 1.85½ | 1.85½ |
| Cold-finished bars, Pittsburgh | 2.00 | 2.00 | 2.10 | 2.00 |
| Hot-rolled strips, Pittsburgh | 1.45 | 1.50 | 1.50 | 1.55 |
| Cold-rolled strips, Pittsburgh | 2.00 | 2.00 | 2.05 | 2.25 |

## Finished Steel

| *Per Lb. to Large Buyers:* | Dec. 29, 1931 Cents | Dec. 22, 1931 Cents | Dec. 1, 1931 Cents | Dec. 29, 1930 Cents |
|---|---|---|---|---|
| Hot-rolled annealed sheets, No. 24, Pittsburgh | 2.25 | 2.30 | 2.40 | 2.35 |
| Hot-rolled annealed sheets, No. 24, Chicago dist. mill | 2.35 | 2.40 | 2.50 | 2.45 |
| Sheets, galv., No. 24, P'gh | 2.80 | 2.80 | 2.90 | 2.90 |
| Sheets, galv., No. 24, Chicago dist. mill | 2.90 | 2.90 | 3.00 | 3.00 |
| Hot-rolled sheets, No. 10, P'gh | 1.60 | 1.60 | 1.70 | ... |
| Hot-rolled sheets, No. 10, Chicago dist. mill | 1.70 | 1.70 | 1.80 | ... |
| Wire nails, Pittsburgh | **1.95** | 1.90 | 1.90 | 1.90 |
| Wire nails, Chicago dist. mill | **2.00** | 1.95 | 1.95 | 1.95 |
| Plain wire, Pittsburgh | 2.20 | 2.20 | 2.20 | 2.20 |
| Plain wire, Chicago dist. mill | 2.25 | 2.25 | 2.25 | 2.25 |
| Barbed wire, galv., P'gh | **2.60** | 2.55 | 2.55 | 2.55 |
| Barbed wire, galv., Chicago dist. mill | **2.65** | 2.60 | 2.60 | 2.60 |
| Tin plate, 100-lb. box, P'gh | $4.75 | $4.75 | $4.75 | $5.00 |

## Old Material

| *Per Gross Ton:* | | | | |
|---|---|---|---|---|
| Heavy melting steel, P'gh | $10.25 | $10.25 | $10.25 | $12.75 |
| Heavy melting steel, Phila. | 7.50 | 7.75 | 8.00 | 11.00 |
| Heavy melting steel, Chicago | 7.75 | 7.75 | 8.00 | 10.00 |
| Carwheels, Chicago | 8.50 | 8.50 | 8.50 | 11.75 |
| Carwheels, Philadelphia | 11.50 | 11.50 | 11.50 | 14.00 |
| No. 1 cast, Pittsburgh | 10.00 | 10.00 | 10.00 | 12.50 |
| No. 1 cast, Philadelphia | 10.00 | 10.00 | 10.50 | 12.00 |
| No. 1 cast, Ch'go (net ton) | 8.50 | 8.50 | 8.50 | 9.50 |
| No. 1 RR. wrot., Phila. | 9.50 | 9.50 | 9.50 | 13.50 |
| No. 1 RR. wrot., Ch'go (net) | 6.50 | 6.50 | 6.50 | 8.50 |

## Coke, Connellsville,

| *Per Net Ton at Oven:* | | | | |
|---|---|---|---|---|
| Furnace coke, prompt | $2.25 | $2.25 | $2.40 | $2.50 |
| Foundry coke, prompt | 3.50 | 3.50 | 3.50 | 3.50 |

## Metals,

| *Per Lb. to Large Buyers:* | Cents | Cents | Cents | Cents |
|---|---|---|---|---|
| Lake copper, New York | 7.37½ | 7.37½ | 6.87½ | 10.62½ |
| Electrolytic copper, refinery | 7.00 | 7.00 | 6.50 | 10.25 |
| Tin (Straits), New York | *21.80* | 21.87½ | 21.00 | 26.87½ |
| Zinc, East St. Louis | 3.15 | 3.15 | 3.12½ | 4.12½ |
| Zinc, New York | 3.50 | 3.50 | 3.47½ | 4.47½ |
| Lead, St. Louis | 3.55 | 3.55 | 3.65 | 4.95 |
| Lead, New York | 3.75 | 3.75 | 3.85 | 5.10 |
| Antimony (Asiatic), N. Y. | *6.15* | 6.25 | 6.50 | 7.10 |

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

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# ▲▲▲ The Iron Age Composite Prices ▲▲▲

| | Finished Steel | Pig Iron | Steel Scrap |
|---|---|---|---|
| Dec. 29, 1931 | 2.052c. a Lb. | $14.79 a Gross Ton | $8.50 a Gross Ton |
| One week ago | 2.075c. | 14.79 | 8.58 |
| One month ago | 2.102c. | 14.96 | 8.75 |
| One year ago | 2.121c | 15.90 | 11.25 |
| | Based on steel bars, beams, tank plates, wire, rails, black pipe and sheets. These products make 87 per cent of the United States output. | Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham. | Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago. |

| | Finished Steel High | Finished Steel Low | Pig Iron High | Pig Iron Low | Steel Scrap High | Steel Scrap Low |
|---|---|---|---|---|---|---|
| 1931 | 2.142c., Jan. 13 | 2.052c., Dec. 29 | $15.90, Jan. 6 | $14.79, Dec. 15 | $11.33, Jan. 6 | $8.50, Dec. 29 |
| 1930 | 2.362c., Jan. 7 | 2.121c., Dec. 9 | 18.21, Jan. 7 | 15.90, Dec. 16 | 15.00, Feb. 18 | 11.25, Dec. 9 |
| 1929 | 2.412c., April 2 | 2.362c., Oct. 29 | 18.71, May 14 | 18.21, Dec. 17 | 17.58, Jan. 29 | 14.08, Dec. 3 |
| 1928 | 2.391c., Dec. 11 | 2.314c., Jan. 3 | 18.59, Nov. 27 | 17.04, July 24 | 16.50, Dec. 31 | 13.08, July 2 |
| 1927 | 2.453c., Jan. 4 | 2.293c., Oct. 25 | 19.71, Jan. 4 | 17.54, Nov. 1 | 15.25, Jan. 11 | 13.08, Nov. 22 |
| 1926 | 2.453c., Jan. 5 | 2.403c., May 18 | 21.54, Jan. 5 | 19.46, July 13 | 17.25, Jan. 5 | 14.00, June 1 |
| 1925 | 2.560c., Jan. 6 | 2.396c., Aug. 18 | 22.50, Jan. 13 | 18.96, July 7 | 20.83, Jan. 13 | 15.08, May 5 |

# Pittsburgh Mills Resuming Production; Weakness in Prices Continues

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PITTSBURGH, Dec. 29.—The last days of the year find Pittsburgh steel makers gradually resuming production at about the rate which prevailed before the holiday suspensions. Efforts are also being made to correct the demoralized price situation which has been in evidence in the last few weeks. Releases of some products have also gained slightly because of the increase in freight rates to take effect on Jan. 4. However, this has influenced movement of raw materials, such as pig iron, more than finished steel.

Outstanding in the week's business was the placing of the structural steel for the Pittsburgh Post Office, amounting to 15,000 tons. Otherwise tonnage has been of the usual hand-to-mouth character. Many users whose requirements have been rather steady are holding up shipments because of inventory taking.

Releases from the automotive industry to mills in this district have been meager. Business from the Ford Motor Co. is still lacking. Releases from the railroads are beginning to appear in small volume, although little new buying has developed.

Steel ingot output in the Pittsburgh district has increased slightly over the minimum levels which prevailed last week, when most of the available capacity was inactive. Production in banked blast furnaces and open-hearths will be resumed over the week-end at most plants. Some of the smaller companies resumed production yesterday. The average raw steel output for the current week will fall under 20 per cent of capacity, but production in the Valleys has risen to about 25 per cent, and the Wheeling district averages 30 per cent. Finishing mill schedules are still intermittent, but will be boosted considerably next week.

Prices are generally weak, but steel producers are making efforts to correct the situation, particularly on the heavy hot-rolled products. On Thursday of last week makers of steel bars quite generally offered to take first quarter contracts from their larger customers at 1.50c., Pittsburgh, and some business was closed. As has been attempted on previous occasions, a price of $2 a ton higher was to apply on orders from small users. Since then the mills have been making an effort to restore the 1.60c. price as the regular market quotation, but with what success remains to be seen. While

**Steel plant operations increase slightly, with indications of further resumption next week.**

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**Efforts being made to correct demoralized price situation. Bars quoted lower.**

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**Steel for Pittsburgh Post Office, about 15,000 tons, is awarded.**

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**Freight rate advance to take effect Jan. 4 brings some releases on pig iron and steel.**

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plates and shapes have been quotable recently at 1.50c., Pittsburgh, with some sales at 1.40c., an effort will also be made to strengthen the prices of those commodities.

Quotations on flat-rolled products are depressed, with correct schedules difficult to determine. Hot-rolled strip is definitely quotable at $1 a ton under recent levels, and generally lower levels are being established on sheets. Semi-finished steel is also lower, reflecting the depressed quotations of non-integrated makers of sheets and strip. Wire prices, on the contrary, are holding at recently advanced levels, and mills are making efforts to get specifications against old low-priced contracts before the end of the year. Some tonnage has been booked for first quarter at the higher levels.

## Pig Iron

A slight increase in shipping orders has developed because of the freight rate advances to take effect Jan. 4. Some users are taking in a number of orders owed to them on old contracts, and there is some spot buying to avoid the freight rate advances. Scarcely any first quarter inquiry has appeared, and little is expected in view of the indefinite outlook for first quarter business. Prices continue nominally at $15.50, Valley furnace, for foundry iron and $16 for malleable and Bessemer. Pittsburgh furnace prices are $1 a ton higher on the foundry grade and 50c. on malleable and Bessemer.

## Semi-Finished Steel

No contracting is reported, but quotations are nominally weaker on occasional spot sales. Billets, slags and sheet bars are now quotable at $28 to $29, Pittsburgh or Youngstown, while forging billets are unchanged at $35. Specifications for wire rods have been slightly heavier because of the advance in price to be made Jan. 1. A little new contracting for rods at $37, Pittsburgh, is reported.

## Rails and Track Supplies

No new business is coming into the market, but mills believe that specifications for accessories will be slightly heavier after the first of the month. The Louisville & Nashville has placed an order for fastenings with a Southern mill. Prices on track accessories for the first quarter have been clarified, with lower levels established on spikes and track bolts.

## Bolts, Nuts and Rivets

A little first quarter contracting is reported, but most users are buying only for their immediate needs because of the weak price situation. Quotations are nominal at 73, 10 and 10 per cent off list for bolts and nuts, and $2.25 per 100 lb. for large rivets.

## Bars, Plates and Shapes

The 15,000 tons of structural steel required for the Pittsburgh Post Office has been awarded to the Fort Pitt Bridge Works Co. Other fabricated contracts closed in the last week of the year include a bridge in Pittsburgh requiring 380 tons. Otherwise, structural awards have not amounted to much and new inquiry has been light. Reinforcing bars are also quiet, although some road tonnage for shipment early in the new year is still being booked. Scarcely any tonnage in merchant bars is being placed, and shipments in the last two weeks have been at a minimum. Plates are also quiet, but the prospect for barge and other river equipment buying after the first of the year is good. Local fabricators are quoting on several pontoons for the United States Engineer at Kansas City, which will take 450 tons of plates. A Pittsburgh river operator is reported to be preparing to take bids on a tow boat.

The new price situation on these products is covered in a foregoing paragraph of this report.

## Cold Finished Steel Bars

The price change announced last week has brought in little tonnage,

although consumers are more willing to place first quarter contracts than they had been heretofore. Current releases are at the lowest rate of the year.

### Tubular Goods

With the pipe market reflecting the usual year-end dullness, mills are still showing interest in prospective line pipe inquiries which are said to involve considerable tonnages. Standard pipe is very dull, and oil country goods are moving to distributers' stocks in very limited volume.

### Wire Products

Specifications for nails, barbed wire and other merchant products, on which price advances are to take effect Jan. 1, are improving considerably. Mills have notified customers that tonnage on old contracts which is not ordered out by the end of the month will be cancelled, although consumers may defer shipments until Jan. 15, if they so desire. Mills are not pressing for new contracts, being more interested in getting old low-priced tonnage off their books. The new schedules seem to be well maintained, with nails quoted at $1.95 a keg in carload lots, and manufacturers' wire at 2.20c., Pittsburgh.

### Sheets

In spite of the fact that specifications have been exceptionally light in the last week and new buying almost negligible, the price situation is still very unsatisfactory. Quotations are lower on practically the entire line of sheet mill products, and minimum levels are difficult to determine. Production last week dropped to about 20 per cent of capacity, and there is no prospect of an increase until the first week of January. New requirements of the automobile industry are light, but better demand is expected next week, even though one large interest continues to stay out of the market.

### Tin Plate

Production has held up fairly well during the holidays, although one or two plants in the district have suspended operations, one of them for repairs. Schedules this week average from 35 to 40 per cent, with the prospect of an increase next week which will bring production to approximately the same levels which prevailed during December.

### Strip Steel

Little business has developed in the last week, and a number of plants are still idle. However, those which ran last week are not running in the current period, and the reverse is generally true. As a result, production still averages slightly under 20 per cent of capacity. Prices on hot-rolled strip are lower, with practically all makers now quoting 1.40c. to 1.45c., Pittsburgh, on 6-in. material and wider, and 1.50c. to 1.55c. on the narrow widths. Quotations on cold-rolled strip range from 2c. to 2.10c.

### Coke and Coal

No activity has developed in this market, and year-end contracting on both furnace and foundry coke is quieter than usual. Shipments of the foundry grade in the last week or two have declined almost to the vanishing point, but many consumers will have to build up their stocks immediately after the first of the year. Domestic coke is still quiet, although colder weather is stimulating movement out of dealers' stocks.

### Old Material

Scarcely any buying of scrap has been reported in the last week, although dealers have disposed of a few distress cars occasioned by hold-ups at most of the consuming points. Prices on these lots are not representative of the market, and quotations are nominally unchanged at the levels which have prevailed for several weeks. Blast furnace scrap and machine shop turnings are slightly weaker. A number of scrap users which have had hold-ups in effect for a week or two are again taking shipments. New buying is expected in the next week.

The monthly list of the Pennsylvania Railroad, on which bids are to be taken Jan. 6, contains 12,900 tons of scrap, including 2000 tons of heavy melting steel.

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## Pacific Coast Jobbers Advance Nail Prices; Week's Steel Business Is Very Light

SAN FRANCISCO, Dec. 28.—Because of the holidays, the volume of steel business the past week has been light. The awards of reinforcing bars totaled a little under 1400 tons, with inquiries for new projects calling for 1650 tons. Fabricated structural steel awards were only 700 tons, but no new business came into the market. Long Beach, Cal., will open bids tomorrow (Dec. 29) on a small quantity of rails for harbor spurs. The structural steel for a Martinez, Cal., building, 650 tons, has been awarded.

Jobbers have announced an advance in the base price of wire nails to apply at all Pacific Coast distributing points. The new base is $2.50 a keg in carload quantities and $2.75 for less-carload lots, f.o.b. warehouse. This is a rise of 10c. per 100 lb. in the base price.

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## Buffalo Pig Iron Producers Reduce Prices $1 a Ton for Delivery in That District

BUFFALO, Dec. 29.—Buffalo pig iron producers last week announced a reduction of $1 a ton on all grades of foundry and malleable iron, making the base for No. 2 plain $16 and for malleable, silicon 2.25 per cent, maximum, $16.50. The decreased prices are expected to stimulate inquiries, as it is known that considerable iron is destined to be placed after the first of the year.

### Finished Material

The Lackawanna plant of Bethlehem Steel is down to five open-hearths for the holiday period. Republic Steel is operating this week three open-hearths and Wickwire Spencer two. Decision will be made some time this week by the city of Buffalo on the use of steel water pipe. Bids have been received on 456 tons of 60-in. steel pipe and 2163 tons of 36-in. steel pipe, also 1869 tons of 60-in. and 48-in. cast iron pipe, 6142 tons of 36-in. cast iron pipe, 405,000 lb. of 60-in. cast iron specials and 309,000 lb. of cast iron fittings.

### Old Material

Few transactions were reported in the past week. The new $8 price for No. 1 heavy melting steel, established by the leading consumer last week, stands, but no new purchases are reported.

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## Cincinnati Pig Iron Orders Decline

CINCINNATI, Dec. 29.—The pig iron market has reflected the usual year-end decline in demand. Bookings totaled about 800 tons, of which 200 tons was Southern iron. An Indiana consumer closed for 300 tons of Northern foundry iron for first quarter; the inquiry called for 500 tons. Three other inquiries for 500 to 1000 tons each of Northern iron are still open. No other interest in next year's requirements has been shown. Prices on Southern iron are firm, while close competition outside Cincinnati keeps Northern prices uncertain.

### Old Material

The scrap market is quiet and featureless. Occasional small purchases fail to test prices, which are unchanged.

# Chicago Mills Announce Higher Prices on Plates, Shapes and Bars

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CHICAGO, Dec. 29.—Steel producers are announcing higher quotations on plates, shapes and bars. The Inland Steel Co. has named 1.70c. a lb., Chicago, for these commodities for delivery after Jan. 1, and other sellers are taking the same stand.

This market is characterized by almost a total lack of new buying, while specifications are somewhat smaller than had been expected in view of the advance in freight rates to go into effect Jan. 4.

Steel production, counting shutdowns on holidays and week-end, is not averaging above 15 per cent of ingot capacity. However, producers expect to swing back to about 22 per cent next week. Several bar mills, including rail steel units, have closed down for the remainder of the week. Shutdowns are almost universal among foundries.

From the viewpoint of tonnage, the structural market shows somewhat more promise, but some recent prices named by shops have been very low. Railroad equipment inquiries are almost wholly absent, and there are no reports of any kind that lend encouragement to car builders. Railroad shops are continuing moderate repair programs.

Chicago contractors have placed orders for about 1500 tons of sheets, including a round tonnage of chromium-plated sheets for the Post Office. It is understood that a large Midwestern mail order house has imported 150,000 kegs of nails from Europe.

**Chicago district producers, led by Inland Steel Co., have announced a minimum price of 1.70c. for plates, shapes and bars, a $2 a ton advance, for first quarter.**

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**Steel ingot operations sharply reduced this week to about 15 per cent of capacity.**

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**Increasing specifications from farm equipment industry brightest spot in market.**

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**Higher freight rates, to go into effect Jan. 4, have affected shipments only slightly.**

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### Pig Iron

Shipments of Northern foundry iron have fallen off sharply, as most foundries in this district will remain closed until early in the new year. Here and there a carload is ordered out when a user decides to take advantage of present freight rates, which are scheduled to be advanced Jan. 4. New buying is dull and inquiries are the lowest in many weeks. A few carloads of Southern iron have been placed at $11 a ton, Birmingham, plus full differentials. The charcoal iron market is quiet, with quotations at $20 a ton for iron delivered from furnaces. The silvery market is listless.

### Ferroalloys

Contracting for ferromanganese is practically at an end. Shipments of this commodity are exceedingly low, with only a few specifications entered for delivery in the new year. No transactions of size are reported in spiegeleisen.

### Coke

The local by-product foundry coke market is steady at $7.50 a ton, ovens. A few users are ordering out tonnages in anticipation of the advance in freight rates. Otherwise, the movement is considerably lighter than earlier in the month.

### Bolts, Nuts and Rivets

Most producers in this district have stopped operations for inventory purposes and the holidays. New buying is exceptionally dull. Only farm implement manufacturers are entering specifications that lend cheer to the trade.

### Warehouse Business

Distribution from warehouses is almost at a standstill, a condition not unusual near the end of a year. New cutting extras are to take effect Jan. 1.

### Reinforcing Bars

Slowness of this market is preventing tests of new prices recently issued by dealers. However, quotations at the new levels are being made in increasing number, and the stability of the new price structure should soon be known. The early part of 1932 is promising for paving and public work. Estimators, whose normal personnel has been cut in half, are well engaged on work of this kind. The outlook for private work is not promising.

### Wire Products

Orders that accumulated over the holidays are very light. Most of the producing units have scaled production to about 15 per cent of capacity. Demand from the manufacturing trade is light. Jobbers' stocks are low and almost any increase in their deliveries will bring them to the mills for replenishment.

### Cast Iron Pipe

Only one transaction of size is noted in this district, this being an order placed by South Milwaukee, Wis. Plans are developing at Milwaukee, but no information is available as to when prices will be taken. Prices continue to give ground, with small tonnages of 6-in. pipe being quoted at $33, Birmingham, or $41, delivered Chicago.

### Structural Material

Awards total 2500 tons, and new projects call for 8000 tons. Private work is more promising. Two railroads have placed 500 tons for new bridges. Included in the pending list is a power plant for a public utility and an apartment store building in Indiana. Prices on fabricated material are weak. Stocks of plain material at local shops are at the low point of the year.

### Rails and Track Supplies

This market is exceptionally quiet. A movement is under way to construct an 800-mile line from western Colorado to southern California.

### Plates

Only limited quantities of plates are moving to railroad shops. The only railroad equipment inquiries are for 150 gondolas and 300 underframes. Prospects for tank tonnages are poor.

### Bars

The tonnage of bars moving is holding up better than that of other finished steel products. The farm implement makers are indicating their

desire for new tonnages. The outlook in the automobile field is uncertain, and most miscellaneous users are less active than earlier in the month. Rail steel bar mills are idle this week, as are also the units of one mild steel bar producer.

### Sheets

Hot mill operations are at about 15 per cent of capacity. Inquiries for delivery in the new year are scarce, and there is no real indication of what January is to bring in the way of business.

### Old Material

Prices are nominal, as the trade marks time waiting to see what the new year will usher in. Most mill deliveries of heavy melting steel have been stopped. Dealers have allowed orders to run low, as they stand by to watch the effects of new freight rates that are to go into effect Jan. 4. Increased interstate switching charges, which went into effect early this month, have thus far been absorbed by dealers on existing contracts and passed back to producers on new transactions.

**United States Imports of Pig Iron by Countries of Shipment**

(In Gross Tons)

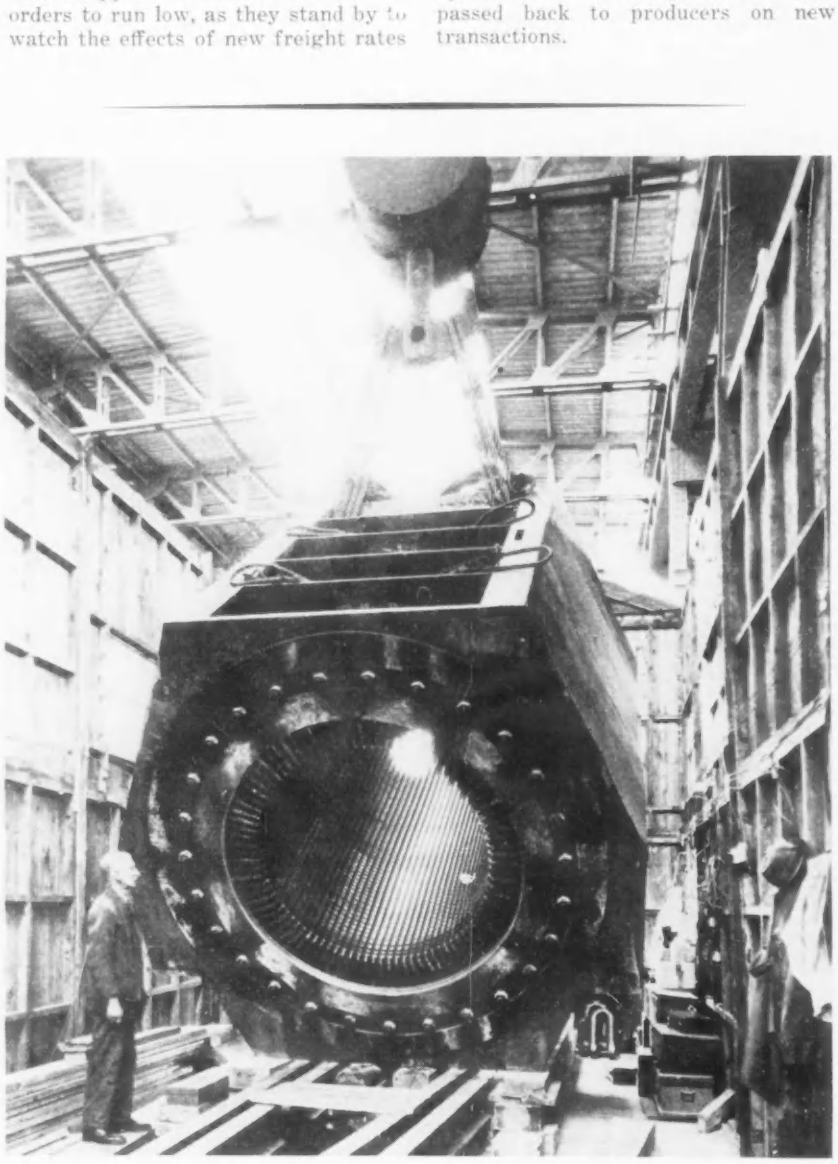
| | November | | 11 Months Ended November | |
|---|---|---|---|---|
| | 1931 | 1930 | 1931 | 1930 |
| India | 7,148 | 16,999 | 65,938 | 94,600 |
| United Kingdom | 50 | 1,000 | 2,656 | 13,146 |
| Germany | .... | .... | 202 | 50 |
| France | .... | .... | 25 | .... |
| Netherlands | 333 | 155 | 6,902 | 6,196 |
| Sweden | .... | .... | 3,401 | 3,302 |
| Norway | .... | .... | 225 | 2,834 |
| Canada | 1,274 | 54 | 2,608 | 616 |
| Belgium | .... | 54 | 300 | 669 |
| All others | .... | 30 | 1,158 | 828 |
| Total | 8,805 | 18,292 | 83,415 | 122,241 |

## Pig Iron Imports Advance Sharply

November imports of pig iron into the United States are reported by the Department of Commerce at 8805 gross tons, virtually double the October figure of 4413 tons, and the largest month's total since that for last June. The incoming tonnage, however, was less than one-half that of November, 1930, at 18,292 tons.

In the 11 months imports have been 83,415 tons, a drop of 32 per cent from the 122,241 tons in the same period of 1930.

India furnished more than 80 per cent of the November tonnage in both years, and almost 80 per cent in each of the 11-month periods. In 11 months Netherlands, Sweden, Canada and Germany showed increases over 1930, whereas imports from the United Kingdom in that period were only one-fifth as great as in 1930. Those from India, the chief source of supply, dropped more than 30 per cent.



THIS stator core for a turbo-alternator, rated 62,500 kva., 9500 volts, 50 cycles and 1500 r.p.m., is so large that it had to be assembled on the site. It is being made by the British Thomson-Houston Co., Ltd., Rugby, England, for the Ironbridge station of the West Midlands joint electricity authority, and when completed will weigh 95 tons.

## Lower Tariff Requested on Ferrosilicon, Aluminum

WASHINGTON, Dec. 29.—The Tariff Commission has announced that it will hold a hearing on Jan. 26 on an application to reduce the duty of 5c. per lb. on ferrosilicon, aluminum and related alloys. Application for reduction of the duty has been made by Fred Trumpy, New York, an importer representing the Lonza Usines Electriques et Chimiques, in Switzerland.

## 800-Mile Railroad May Be Built in West

The Denver & Pacific Railroad Co., Salt Lake City, Utah, care of Colman Crenshaw, Salt Lake City, president, recently chartered under Delaware laws, has applied to the Interstate Commerce Commission for permission to build a railroad from Denver to Los Angeles, through Colorado River Valley, 800 miles, to cost over $50,000,000.

# Cleveland Mills Get Larger Orders for Sheets and Strip

## Some of the Motor Car Manufacturers Buy for January Requirements—Bars and Flat-Rolled Products Lower

CLEVELAND, Dec. 29.—Orders for good tonnages of sheets and hot and cold-rolled strip from some of the motor car manufacturers put a little life into an otherwise dull market week. Two local steel plants resumed open-hearth operations Monday after a four-day holiday shutdown, but a third did not suspend operations for the holiday. Cleveland plants are operating this week at 32 per cent of ingot capacity, or the same as during the first half of last week.

The Erie Railroad has sent out its rail inquiry, which was not expected until January. While the tonnage is not specified, the inquiry calling for rails for the road's 1932 requirements, it is understood that its purchases will aggregate about 40,000 tons, or not much less than its rail orders in 1931, which were close to 42,000 tons.

Steel purchases by the automotive industry cover January requirements and indicate fair production schedules by some of the motor car manufacturers during the coming month. Inquiries from the Ford Motor Co. have not yet materialized. Sales of medium and low-priced automobiles by dealers are reported to be fair, but cars around the $2,000 class are moving very slowly.

The outstanding development in the price situation is a $2 a ton reduction on steel bars to 1.50c., Pittsburgh, and 1.55c., Cleveland, for the first quarter. Several mills have made this reduction, but are attempting to place in effect a quantity differential by naming a $2 a ton higher price for car lots. While a local mill has not named its price, it expects to follow the market. Plate and shape prices have not yet been announced for the coming quarter. These range from 1.50c. to 1.60c. for current business, the higher price generally applying to small-lot orders. Hot-rolled strip has again declined to 1.40c., Pittsburgh, for wide and 1.50c. for narrow on attractive tonnages from the motor car industry, or $1 a ton below the prices that these large consumers recently paid. Sheets, though still irregular, have generally settled for round lots to the recently quoted minimum prices. Sheet bars, billets and slabs are $1 a ton lower.

### Pig Iron

General Motors Corpn. has closed new long term contracts with Lake furnaces for the pig iron requirements of its various foundries. While the tonnage involved is not disclosed, it has been in excess of 100,000 tons in normal years. Sales and inquiries were very light the past week, as is usually the case during the holiday period. Shipping orders have been slightly stimulated in anticipation of the advance in freight rates, which will become effective Jan. 4. The freight advance or surcharge is 12c. a ton for line hauls and 10 per cent for switching charges. As local switching charges average about 50c. a ton, local consumers will gain a slight advantage over those not located within the switching area. Prices are unchanged and untested at $15 to $15.50, Cleveland, for foundry and malleable iron for outside shipments and $16 for local delivery.

### Semi-Finished Steel

A local mills is now quoting sheet bars, billets and slabs at $28, Cleveland, Youngstown and Pittsburgh, or a reduction of $1 a ton for current orders. Prices have not been named for the first quarter, as no interest is shown in contracts.

### Bars, Plates and Shapes

While demand for these products is slow, orders held up with some of the mills during the holiday week about as well as during the previous weeks of December. All orders are for small lots. Little interest is being shown in first quarter contracts. Activity in the construction field is limited to public work. The Ohio State Highway Department received bids today for numerous bridge projects requiring 650 tons of structural steel and the same tonnage of reinforcing bars, only one job taking over 100 tons.

### Strip

Orders for considerable tonnage of both hot and cold-rolled strip were placed by the motor car industry during the week. Prices on hot-rolled strip have further declined, some round lot orders having been placed at 1.40c. for wide and 1.50c. for narrow. More commonly quoted prices are $1 a ton higher and car lots are $2 a ton higher or 1.50c. for wide and 1.60c. for narrow. Cold-rolled strip is commonly quoted at 2c., Cleveland, with $1 to $2 a ton higher for small lots. Fender stock has been shaded to 2.95c., Cleveland.

### Sheets

There was increased activity in the automotive industry during the week and some substantial lots were purchased for early delivery. Fisher Body Corpn. is placing new orders for its Cleveland plant, which is now on a daily production of parts for 2000 Chevrolet bodies. The price situation has become more clarified by the rather general establishment of the recent minimum quotations for round lots, making hot-rolled annealed 2.25c., hot-rolled 1.60c., heavy cold-rolled 2.25c., and light cold-rolled 2.85c. Small lots are bringing $2 a ton higher, although on hot-rolled annealed sheets some producers are still asking 2.40c. Auto body sheets appear fairly stable at 3c.

### Old Material

Limited quantities of heavy melting steel, No. 1 busheling and machine shop turnings are being taken by Valley district mills. There is no demand from local consumers. The trade expects a moderate increase in shipping orders after Jan. 1, which should give the market a little more life.

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# New England Pig Iron Sales About 700 Tons

BOSTON, Dec. 29.—Pig iron sales were approximately 700 tons the past week, of which more than half were made by a New York State furnace. There is no inquiry of any size in the market. Boston is in the market for 675 tons of castings, and the number of bidders will be the largest on record for any city job.

**Old Material**

Market conditions are unchanged. Brokers have very few orders, and their prices are too low to attract sellers, consequently little material is being moved. Stocks of scrap are small.

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# Detroit Scrap Prices Decline 25c. a Ton

DETROIT, Dec. 29.—In the absence of purchases by consumers, local scrap prices declined another 25c. a ton the past week. However, quotations are largely nominal. The usual year-end dullness seems likely to carry over until at least the middle of January.

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Orders for mechanical stokers having a capacity of over 300 lb. of coal per hour totaled 62 units of 13,231 hp. in November, against 83 of 20,339 hp. in October, according to reports received by the Bureau of the Census from 21 manufacturers. In the first 11 months of 1931 orders for this type of stoker totaled 940 units of 236,740 hp., compared with 1126 of 353,938 hp. in the corresponding period of 1930.

# Eastern Pennsylvania Mills Book Increased Sheet Tonnage

## Automobile Builders Place Small Orders; Ingot Output Continues at About 12 Per Cent

PHILADELPHIA, Dec. 29.—Except for orders for a fair tonnage of sheets from automobile body builders, steel buying is at a low level. Ingot production for eastern Pennsylvania is unchanged at about 12 per cent of capacity. With consumers' inventories greatly reduced, some replacement buying is expected in January. Sheet makers have experienced improvement in orders from automobile body and accessory manufacturers, so that shipments recently have increased 10 to 15 per cent from totals in previous months. Prices, however, are weak. Makers of bars, plates and shapes are now willing to book first quarter business at 1.50c., Pittsburgh, for all three products.

About 8000 tons of plates and shapes for two railroad car transports to be built by the Sun Shipbuilding & Dry Dock Co., Chester, Pa., has been awarded to Worth Steel Co., Lukens Steel Co., Bethlehem Steel Co. and Carnegie Steel Co. Fabrication of chutes and bins at the St. Nicholas, Pa., coal breaker has been awarded to Connery & Co., Philadelphia. It is generally expected that the Government will buy steel instead of wood piling for its channel deepening project at Pea Patch Island, as the bids received for furnishing steel were within the extra allowed in the appropriation. Fitzgibbons & Crisp, Inc., Trenton, N. J., is expected to close in the next week or 10 days on upward of 800 tons of ⅛ to 3-16-in. sheets for bodies and tanks on sprinkler trucks to be built for New York City.

### Pig Iron

The week has been quiet, but a resumption of carload buying of foundry iron is expected early in January. A fire at the Altoona, Pa., shops of the Pennsylvania Railroad may delay purchase of pig iron for about 10,000 tons of cast iron segments, which the railroad intended to make at Altoona for use in a Baltimore tunnel. An inquiry is current for 1000 tons of malleable iron.

### Plates, Shapes and Bars

Demand for bars and shapes is small, but plate mills are bidding on some small tonnage business, especially in heavy gages of sheets for use by automobile body and chassis builders. Bars are now quoted at 1.50c. to 1.60c., Pittsburgh. Plates range in price from 1.60c. to 1.65c., Coatesville, or 1.68½c. to 1.73½c., Philadelphia. Only small lots of shapes are being inquired for, and on such business the usual quotations are from 1.60c. to 1.65c., f.o.b. nearest mill to consumer, or 1.64½c. to 1.69½c., Philadelphia.

### Sheets

Blue annealed sheets in the heavier gages and some automobile body sheets are in demand. Prices lack firmness.

### Imports

In the week ended Dec. 26, arrivals at this port consisted of 188 tons of pig iron from British India and 10 tons of structural shapes from Belgium.

### Old Material

The consumer at Bethlehem, Pa., is still accepting carload lots of No. 1 steel at $7 a ton, delivered. This interest, on Jan. 4, will begin loading barges in New York harbor with No. 1 and No. 2 steel, for shipment to Buffalo in the spring.

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# St. Louis Farm Implement Manufacturers Issue Additional Pig Iron Releases

ST. LOUIS, Dec. 29.—Additional shipping orders against contracts for pig iron were issued during the week by implement manufacturers in the St. Louis territory, making it possible for the St. Louis Gas & Coke Corpn. to make a good showing for shipments in December. Otherwise, the trade is experiencing the usual holiday dullness. The local maker will make no change in prices for the first quarter.

### Finished Material

Since Dec. 1 the usual seasonal influences, including inventory retrenchments, have further slowed down the rate of operations of district mills, foundries and other ferrous metalworking plants, whose production and shipments for November represented the lowest month of the downward movement, according to the report of the Federal Reserve Bank of St. Louis. During the week, the holidays further slowed up buying.

Bids will be opened Jan. 4 on 600 tons of plates for pontoons by the United States Engineers' Office at Kansas City, Mo.

### Old Material

All open-hearth furnaces in the St. Louis Industrial district issued orders during the last week to dealers to withhold shipments of all scrap iron against contracts until after Jan. 1. Mills have not indicated when they again will be in the market for material. Prices are nominally unchanged. Railroad lists: Union Pacific, 2000 tons; New York, Chicago & St. Louis, 21 carloads; Nashville, Chattanooga & St. Louis, 7 carloads.

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# Birmingham Steel Operations at Low Point; Ensley Rail Mill to Resume Next Week

BIRMINGHAM, Dec. 29.—The Ensley rail mill of the Tennessee Coal, Iron & Railroad Co. will resume operations on Jan. 4, according to an announcement by H. C. Ryding, president. The mill has been idle since July. An additional blast furnace has already been blown in at Ensley and several open-hearths are also scheduled to become active again. These increased facilities will bring about 1000 men back to work.

Holiday shutdowns, in many instances, are of longer duration than usual. With a few exceptions, Gulf States Steel Co. units will not go back to their former schedules until Jan. 4. American Cast Iron Pipe Co. will be idle until Jan. 11. One department of National Cast Iron Pipe Co. resumed operations Monday, but others will be shut down until Jan. 11. Mills of the Tennessee Company resumed their regular schedules on Sunday. A number of other plants will be idle until after Jan. 1 or will be on very much reduced schedules during the present week.

New business in finished steel, iron, pipe, etc., is light, as are shipments.

# New York Steel Business Dull; Prices of Bars and Strip Weak

## Larger Bar Users Covered at 1.50c., Pittsburgh — McClintic-Marshall Takes Two Jobs Totaling 14,500 Tons

NEW YORK, Dec. 29.—Some of the larger buyers of steel bars in this district have been able to contract for first quarter at 1.50c., Pittsburgh. An effort is being made, however, to restore a 1.60c. price on bars, this quotation having held fairly well up to last week, despite declines in shapes and plates. Hot-rolled strip steel is being offered at 1.45c., Pittsburgh, for wide and 1.55c. for narrow, though prices $1 a ton below these figures have been quoted in other districts. Hot-rolled annealed sheets have been sold to some of the larger users at 2.25c., Pittsburgh. On account of the weak price situation, there is very little interest among consumers and jobbers in contracting for first quarter.

Steel users are largely marking time until after the first of the year. Except for two good-sized structural steel tonnages, orders the past week were very light. The McClintic-Marshall Corpn. was awarded 12,000 tons for the West Side elevated highway, New York, and 2250 tons for a subway in Newark, N. J.

### Pig Iron

Activity in this market during the past week was at a minimum. Total bookings of 2500 tons compare with 3000 tons the preceding week and 3500 tons two weeks ago. A Connecticut melter closed on 500 tons of foundry iron for prompt shipment; otherwise, orders were for restricted quantities for early January delivery. With practically all foundry operations suspended for the remainder of the year, interest in new purchases is negligible. Some melters, however, have requested anticipation of shipments against standing orders in view of the freight rate increase on pig iron to become effective Jan. 4. This development, however, is not broad enough to lend any significance to the general situation.

Although prices on Buffalo iron have been reduced $1 a ton for delivery in that district, quotations for Eastern shipment remain nominally unchanged.

### Reinforcing Bars

Lower prices on bars have been established at 1.50c., Pittsburgh, or 1.83c., delivered New York. New projects requiring bars covered only small lots. The largest award in the week was to Joseph T. Ryerson & Son, Inc., for 315 tons for the New York Central West Side viaduct from Eighteenth to Thirtieth Street.

### Old Material

Next Monday the Bethlehem Steel Co. will begin loading two barges at West Twenty-ninth Street and Hudson River, New York, with Nos. 1 and 2 heavy melting steel for spring shipment to its Lackawanna, N. Y., plant. A purchasing organization at the pier will buy at the prevailing price for barge shipment. For the first time in about a year a small tonnage of scrap has been bought for the steel plant at Johnstown, Pa. On No. 2 steel for this delivery from the New York and New England districts, $9.90 a ton, delivered, was paid. A broker in New York has sold No. 2 steel to a Weirton, W. Va., consumer at $9.50 a ton, delivered. A Coatesville, Pa., mill has closed on a small tonnage of No. 1 heavy melting steel at $8, delivered, and carload lots of this grade are still being accepted at Bethlehem, Pa., at $7. Other grades of scrap are inactive.

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## Porcelain Enameled Steel to Be Used for Exterior and Interior Trim of Steel House

PORCELAIN enameled steel will be used for the exterior of a welded steel frame house to be built in Cleveland. The outer covering, devised by the Ferro Enamel Corpn., Cleveland, will consist of units in the form of shallow porcelain enameled pans of various sizes having a fiber board backing. Battens covering the joints and also the shingles will be of porcelain enameled steel and the brick chimney will be lined with the same material.

The house will be of dull finish enamel closely resembling rich buff limestone. Bathroom, lavatories, kitchen and basement reception room will be lined with porcelain enameled steel. The door frames and window sash will be of corrosion resisting steel.

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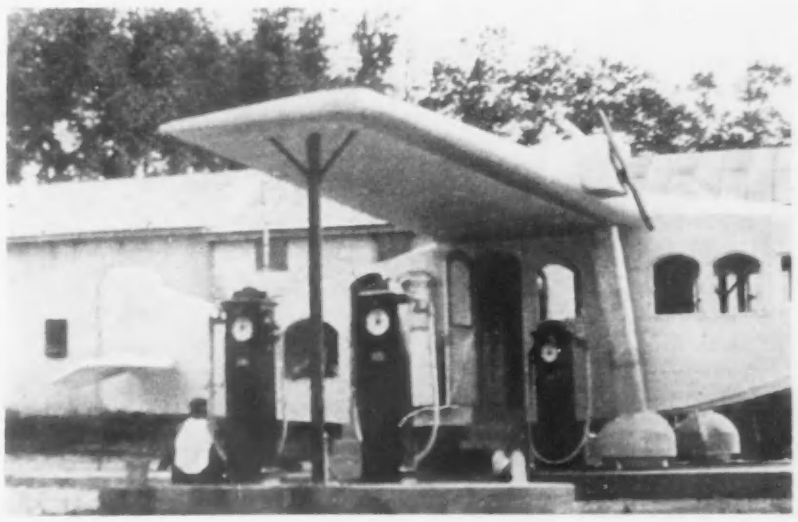
## A Novel Gas Station of Metal

A GASOLINE filling station in the form of a giant cabin monoplane and made entirely of structural steel and Armco iron sheets has been erected by the Dawson-Evans Construction Co., Cincinnati, on route 25, near that city. A structural steel framework was covered with No. 24 gage iron sheets. Even the doors are all of metal. The siding on the "fuselage" is 1¼-in. corrugated material to make it more closely resemble a real airplane. Because of the many severe bends and shapes, the sheet metal work was somewhat intricate and represents the craftsmanship of August C. Meyer & Co., Cincinnati, sheet metal contractors. The cabin section of the imitation airplane includes two washrooms and a room for attendants, while the "tail" is utilized for display of oils and equipment. The wings provide protection to customers in inclement weather.



# Machinery Exports at 15-Year Low in November

WASHINGTON, Dec. 28.—Continuing their downward tendency, exports of machinery in November totaled $14,657,480, compared with $20,184,000 in October. The November total was the smallest for any month since February, 1916. In the first 11 months they amounted to $300,597,069, against $481,902,236 in the like period of 1930. The 11-month total was the lowest since 1924, but was practically the same as in 1925.

Exports of industrial machinery in November were $7,041,260, a drop of $949,000 from October. In the first 11 months they aggregated $133,395,157, compared with $212,691,321 in the same period of 1930.

Despite the drop of 37½ per cent in total machinery exports in 11 months, machine tools in that period held within 3 per cent of the 1930 volume.

Imports of machinery, as listed in THE IRON AGE, were valued at $801,220 in November, against $916,023 in October. In the first 11 months they totaled $11,902,994, against $21,874,673 in the like period of 1930.

**Imports of Machinery into the United States**

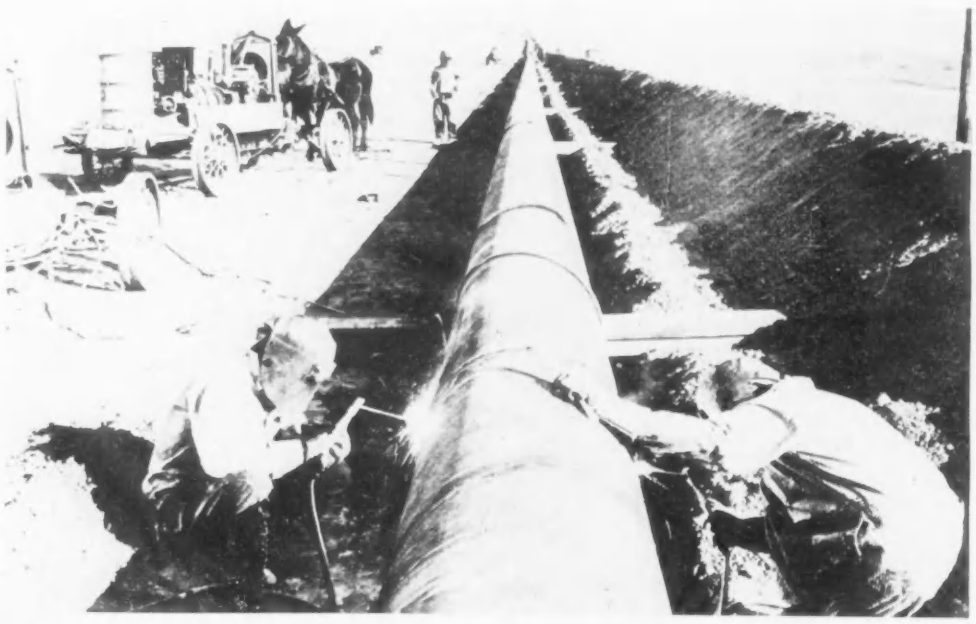
(By Value)

| | November | | 11 Months Ended November | |
|---|---|---|---|---|
| | 1931 | 1930 | 1931 | 1930 |
| Metal-working machine tools | $42,317 | $35,767 | $253,385 | $878,833 |
| Agricultural machinery and implements | 134,507 | 174,516 | 3,146,506 | 8,283,476 |
| Electrical machinery and apparatus | 98,952 | 176,998 | 1,378,534 | 1,502,376 |
| Other power-generating machinery | 9,786 | 24,580 | 284,310 | 527,394 |
| Other machinery | 439,248 | 775,508 | 4,440,937 | 8,319,092 |
| Vehicles, except agricultural | 76,410 | 119,829 | 2,399,322 | 2,263,502 |
| Total | $801,220 | $1,307,198 | $11,902,994 | $21,874,673 |

**Machinery Exports from the United States**

(By Value in Thousands of Dollars)

| | November | | 11 Months Ended November | |
|---|---|---|---|---|
| | 1931 | 1930 | 1931 | 1930 |
| Locomotives | .... | .... | $1,301 | $622 |
| Other steam engines | $2 | $7 | 185 | 529 |
| Boilers | 13 | 42 | 335 | 1,223 |
| Accessories and parts | 25 | 24 | 340 | 768 |
| Automobile engines | 93 | 85 | 2,280 | 5,516 |
| Other internal combustion engines | 179 | 336 | 3,932 | 7,641 |
| Accessories and parts | 119 | 165 | 2,016 | 3,155 |
| Electric locomotives | .... | 139 | 587 | 1,023 |
| Other electric machinery and apparatus | 377 | 633 | 4,293 | 9,394 |
| Excavating machinery | 126 | 369 | 3,837 | 8,777 |
| Concrete mixers | 7 | 48 | 247 | 813 |
| Road-making machinery | 22 | 154 | 1,045 | 3,128 |
| Elevators and elevator machinery | 134 | 489 | 3,037 | 6,785 |
| Mining and quarrying machinery | 487 | 1,175 | 9,814 | 14,576 |
| Oil-well machinery | 162 | 758 | 10,035 | 22,519 |
| Pumps | 158 | 572 | 4,076 | 8,453 |
| Bending and power presses | 613 | 482 | 5,328 | 4,133 |
| Forging machines | 368 | 102 | 3,814 | 1,801 |
| Machine tools | 1,263 | 2,201 | 25,156 | 25,926 |
| Other metal-working machinery and parts | 199 | 265 | 3,663 | 3,614 |
| Textile machinery | 516 | 595 | 6,227 | 8,124 |
| Sewing machines | 381 | 342 | 3,582 | 640 |
| Shoe machinery | 66 | 102 | 940 | 1,562 |
| Flour-mill and gristmill machinery | 7 | 15 | 236 | 430 |
| Sugar-mill machinery | 98 | 326 | 1,057 | 4,123 |
| Paper and pulp-mill machinery | 43 | 341 | 1,186 | 3,324 |
| Saw mill machinery | 20 | 51 | 506 | 669 |
| Other woodworking machinery | 318 | 113 | 849 | 1,671 |
| Refrigerating and ice-making machinery | 79 | 295 | 958 | 3,826 |
| Air compressors | 80 | 336 | 2,294 | 5,321 |
| Typewriters | 754 | 1,181 | 8,280 | 15,642 |
| Power laundry machinery | 89 | 79 | 815 | 1,264 |
| Typesetting machines | 170 | 294 | 2,175 | 3,620 |
| Printing presses | 79 | 178 | 1,919 | 4,661 |
| Agricultural machinery and implements | 828 | 6,172 | 56,537 | 106,864 |
| All other machinery and parts | 6,782 | 14,696 | 127,715 | 189,765 |
| Total | $14,657 | $33,162 | $300,597 | $481,902 |



TWO operators of the Welding Engineering Co., Bartlesville, Okla., are simultaneously welding, with Lincoln Electric Co. apparatus, a 26-in. gas line for the Southern Fuel Co., from Kettleman Hills to Los Angeles

# Metal Buying Declines; Tin Offered Under Import Cost; Copper Sales Fair

NEW YORK, Dec. 29.—Despite the holiday, domestic sales of electrolytic copper in the past week were close to 10,000 tons, about equally distributed between first and second quarter delivery. The current price, 7.25c. a lb., delivered Connecticut Valley, is firmly maintained by custom smelters and primary producers. Copper consumers are well covered for first quarter requirements, but, with firmness in the price, continued buying for second quarter is expected.

The quotation of Copper Exporters, Inc., is unchanged at 7.50c. a lb., delivered usual European ports. Sales of the past week were in fair volume, bringing the total tonnage sold for export so far this month to about 25,000 tons. The Lake copper market is quiet, and the price unchanged at 7.37½c., delivered.

### Tin

There was an almost complete cessation of buying during the past week, and prices here have been well below the cost of importation at the present London level, a result of offerings of tin held by second hands. From 21.95c. a lb., on Dec. 23 and 24, the market settled to 21.80c., yesterday and today. Meanwhile, the London market today is at £141 2s. 6d. for spot standard, £144 5s. for future standard, £143 17s. 6d. for spot Straits and £147 7s. 6d. for shipments from the East. The month's shipments from Singapore, including Dec. 26, total 5107 tons, about the amount originally estimated for the month. Stocks in United Kingdom warehouses have increased 220 tons to a total of 30,913 tons during the week.

### Zinc

Buying has declined, but prices are maintained at 3.15c. a lb., East St. Louis, and 3.50c., New York, for prompt and January delivery. In some instances, sellers are asking 3.17½c., East St. Louis, and 3.52½c., New York, for January. Shipments of zinc in November were at about the level of those in October, and production was 20,526 tons, compared with 21,674 tons in October.

### Lead

Demand was moderately active just prior to the Christmas holiday, but has been quiet since. A resumption of buying is expected early in January, however, as it is estimated that only about 60 per cent of that month's requirements have been covered. The price is firm at 3.75c., New York, and 3.55c., St. Louis.

### Antimony

With demand almost entirely lacking for both the Chinese and domestic metal, importers and the Laredo, Tex., smelter, are quoting antimony for prompt shipment at 6.15c. a lb., duty paid, New York; 5.95c., duty paid, New York, generally rules for future delivery.

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## Recommends Lower Rates On Scrap from South

WASHINGTON, Dec. 29. — Reduced rates on scrap iron from points in North Carolina and Virginia to Ohio, Kentucky, Virginia, Pennsylvania and North Carolina are recommended by Examiner W. R. Brennan in a report to the Interstate Commerce Commission.

He suggests that rates to Ashland, Portsmouth, Ohio; East Radford, Lynchburg, Portsmouth, Va., and Winston-Salem, N. C., in net tons, 50,000 lb., minimum, be established on a basis of 15 per cent on the first class rates prescribed in the recent Southern class rate revision. To Harrisburg and Steelton, Pa., the examiner recommends rates on a basis of 17.5 per cent of the first class rates prescribed in the Southern class rate revision. Complaint against the rates was made by the American Scrap Material Co. and other dealers.

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Gunite Corpn., Rockford, Ill., maker of cast brake drums and general castings, established a new monthly record for tonnage in December. E. J. Mohr, manager, states that the plant has the largest working force since it was started four years ago, and is operating full time, including Saturdays and Sundays.

### The Week's Prices. Cents Per Pound for Early Delivery

| | Dec. 29 | Dec. 28 | Dec. 26 | Dec. 24 | Dec. 23 |
|---|---|---|---|---|---|
| Lake copper, New York | 7.37½ | 7.37½ | 7.37½ | 7.37½ | 7.37½ |
| Electrolytic copper, N. Y.* | 7.00 | 7.00 | 7.00 | 7.00 | 7.00 |
| Straits tin, spot, N. Y. | 21.80 | 21.80 | ... | 21.95 | 21.95 |
| Zinc, East St. Louis | 3.15 | 3.15 | 3.15 | 3.15 | 3.15 |
| Zinc, New York | 3.50 | 3.50 | 3.50 | 3.50 | 3.50 |
| Lead, St. Louis | 3.55 | 3.55 | 3.55 | 3.55 | 3.55 |
| Lead, New York | 3.75 | 3.75 | 3.75 | 3.75 | 3.75 |

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.
Aluminum, 98 to 99 per cent pure, 22.90c. a lb., delivered.
Nickel, electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 6.15c. a lb., New York.

#### From New York Warehouse

*Delivered Prices, Base per Lb.*

| | |
|---|---|
| Tin, Straits pig | 23.75c. to 24.75c. |
| Tin, bar | 25.75c. to 27.75c. |
| Copper, Lake | 8.50c. to 9.50c. |
| Copper, electrolytic | 8.25c. to 9.25c. |
| Copper, casting | 8.00c. to 9.00c. |
| *Copper sheets, hot-rolled | 16.37½c. |
| *High brass sheets | 13.25c. |
| *Seamless brass tubes | 16.50c. |
| *Seamless copper tubes | 15.87½c. |
| *Brass rods | 11.00c. |
| *Brazed brass tubes | 22.00c. |
| Zinc, slab | 4.75c. to 5.25c. |
| Zinc sheets (No. 9), casks | 9.25c. to 9.50c. |
| Lead, American pig | 4.50c. to 5.00c. |
| Lead, bar | 6.25c. to 7.25c. |
| Lead sheets | 8.25c. |
| Antimony, Asiatic | 9.00c. to 10.00c. |
| Alum., virgin, 99 per cent plus | 23.30c. |
| Alum. No. 1 for remelting, 98 to 99 per cent | 17.00c. to 18.00c. |
| Solder, ½ and ½ | 15.25c. to 16.25c. |

*These prices are also for delivery from Chicago and Cleveland warehouses.

#### Metals from Cleveland Warehouse

*Delivered Prices per Lb.*

| | |
|---|---|
| Tin, Straits pig | 27.00c. |
| Tin, bar | 29.00c. |
| Copper, Lake | 8.37½c. |
| Copper, electrolytic | 8.37½c. |
| Copper, casting | 8.00c. |
| Zinc, slab | 4.75c. to 5.00c. |
| Lead, American pig | 4.30c. to 4.50c. |
| Lead, bar | 7.75c. |
| Antimony, Asiatic | 10.00c. |
| Babbitt metal, medium grade | 15.00c. |
| Babbitt metal, high grade | 31.00c. |
| Solder, ½ and ½ | 18.50c. |

#### Old Metals, Per Lb., New York

*Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)*

| | Dealers' Buying Prices | Dealers' Selling Prices |
|---|---|---|
| Copper, hvy. crucible | 5.50c. | 6.25c. |
| Copper, hvy. and wire | 5.25c. | 6.00c. |
| Copper, light and bottoms | 4.25c. | 5.00c. |
| Brass, heavy | 2.75c. | 3.50c. |
| Brass, light | 2.25c. | 3.00c. |
| Hvy. machine composition | 4.25c. | 5.00c. |
| No. 1 yel. brass turnings | 3.25c. | 3.75c. |
| No. 1 red brass or compos. turnings | 3.75c. | 4.50c. |
| Lead, heavy | 2.75c. | 3.125c. |
| Zinc | 1.25c. | 1.75c. |
| Cast aluminum | 3.25c. | 5.00c. |
| Sheet aluminum | 9.00c. | 11.00c. |

# ▲▲▲ Prices of Finished and Semi-Finished Steel,

## BARS, PLATES, SHAPES

### Iron and Steel Bars

*Soft Steel*

| | *Base per Lb.* |
|---|---|
| F.o.b. Pittsburgh mill | 1.50c. to 1.60c. |
| F.o.b. Chicago | 1.60c. to 1.70c. |
| Del'd Philadelphia | 1.79c. to 1.89c. |
| Del'd New York | 1.83c. to 1.93c. |
| F.o.b. Cleveland | 1.55c. to 1.65c. |
| F.o.b. Lackawanna | 1.60c. to 1.70c. |
| F.o.b. Birmingham | 1.70c. |
| C.i.f. Pacific ports | 2.00c. |

*Billet Steel Reinforcing*

| | |
|---|---|
| F.o.b. P'gh mills, 40, 50, 60-ft. | 1.60c. |
| F.o.b. Birmingham, mill lengths | 1.75c. |
| F.o.b. Cleveland | 1.40c. to 1.50c. |

*Rail Steel*

| | |
|---|---|
| F.o.b. mills, east of Chicago dist. | 1.30c. to 1.35c. |
| F.o.b. Chicago Heights mill | 1.50c. to 1.60c. |
| Del'd Philadelphia | 1.49c. to 1.59c. |

*Iron*

| | |
|---|---|
| Common iron, f.o.b. Chicago | 1.60c. to 1.70c. |
| Refined iron, f.o.b. P'gh mills | 2.75c. |
| Common iron, del'd Philadelphia | 2.09c. |
| Common iron, del'd New York | 2.14c. |

### Tank Plates

| | *Base per Lb.* |
|---|---|
| F.o.b. Pittsburgh mill | 1.50c. to 1.60c. |
| F.o.b. Chicago | 1.60c. to 1.70c. |
| F.o.b. Birmingham | 1.70c. |
| Del'd Cleveland | 1.68½c. to 1.78½c. |
| Del'd Philadelphia | 1.73½c. |
| F.o.b. Coatesville | 1.60c. to 1.70c. |
| F.o.b. Sparrows Point | 1.60c. to 1.70c. |
| F.o.b. Lackawanna | 1.60c. to 1.70c. |
| Del'd New York | 1.78c. to 1.88c. |
| C.i.f. Pacific ports | 1.80c. to 1.85c. |

### Structural Shapes

| | *Base per Lb.* |
|---|---|
| F.o.b. Pittsburgh mill | 1.50c. to 1.60c. |
| F.o.b. Chicago | 1.60c. to 1.70c. |
| F.o.b. Birmingham | 1.70c. |
| F.o.b. Lackawanna | 1.60c. to 1.70c. |
| F.o.b. Bethlehem | 1.60c. to 1.70c. |
| Del'd Cleveland | 1.68½c. to 1.78½c. |
| Del'd Philadelphia | 1.64½c. to 1.69½c. |
| Del'd New York | 1.75¼c. to 1.85¼c. |
| C.i.f. Pacific ports (standard) | 2.05c. |
| C.i.f. Pacific ports (wide flange) | 2.15c. |

### Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.65c. per Lb.

| S.A.E. Series Numbers | | Alloy Differential per 100 Lb. |
|---|---|---|
| 2000 | (1½% Nickel) | $0.25 |
| 2100 | (1½% Nickel) | 0.55 |
| 2300 | (3½% Nickel) | 1.50 |
| 2500 | (5% Nickel) | 2.25 |
| 3100 | Nickel Chromium | 0.55 |
| 3200 | Nickel Chromium | 1.35 |
| 3300 | Nickel Chromium | 3.80 |
| 3400 | Nickel Chromium | 3.20 |
| 4100 | Chromium Molybdenum (0.15 to 0.25 Molybdenum) | 0.50 |
| 4100 | Chromium Molybdenum (0.25 to 0.40 Molybdenum) | 0.70 |
| 4600 | Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel) | 1.05 |
| 5100 | Chromium Steel (0.60 to 0.90 Chromium) | 0.35 |
| 5100 | Chromium Steel (0.80 to 1.10 Chromium) | 0.45 |
| 5100 | Chromium Spring Steel | 0.20 |
| 6100 | Chromium Vanadium Bar | 1.20 |
| 6100 | Chromium Vanadium Spring Steel | 0.95 |
| 9250 | Silicon Manganese Spring Steel (flats) | 0.25 |
| | Rounds and squares | 0.50 |
| | Chromium Nickel Vanadium | 1.50 |
| | Carbon Vanadium | 0.95 |

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a section area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

### Cold-Finished Bars

| | *Base per Lb.* |
|---|---|
| Bars, f.o.b. Pittsburgh mill | 2.00c. |
| Bars, f.o.b. Chicago | 2.00c. |
| Bars, Cleveland | 2.00c. |
| Bars, Buffalo | 2.00c. |
| Shafting, ground, f.o.b. mill | *2.35c. to 3.30c. |

*According to size.

## SHEETS, STRIP, TIN PLATE, TERNE PLATE

### Sheets

*Hot-Rolled*

| | *Base per Lb.* |
|---|---|
| No. 10, f.o.b. Pittsburgh | 1.60c. to 1.70c. |
| No. 10, f.o.b. Chicago mills | 1.70c. to 1.80c. |
| No. 10, del'd Philadelphia | 1.94c. to 1.99c. |
| No. 10, f.o.b. Birmingham | 1.85c. |
| No. 10, c.i.f. Pacific Coast ports | 2.33c. |

*Hot-Rolled and Annealed*

| | |
|---|---|
| No. 10, Pittsburgh | 1.75c. to 1.85c. |
| No. 10, Chicago mills | 1.85c. to 1.95c. |
| No. 10, Birmingham | 2.00c. |

*Hot-Rolled Annealed*

| | |
|---|---|
| No. 24, f.o.b. Pittsburgh | 2.25c. to 2.40c. |
| No. 24, f.o.b. Chicago mills | 2.35c. to 2.50c. |
| No. 24, del'd Philadelphia | 2.59c. to 2.69c. |
| No. 24, f.o.b. Birmingham | 2.55c. |
| No. 24, c.i.f. Pacific Coast ports | 2.88c. |

*Heavy Cold-Rolled*

| | |
|---|---|
| No. 10 gage, f.o.b. Pittsburgh | 2.25c. |
| No. 10 gage, f.o.b. Chicago mills | 2.35c. |
| No. 10 gage, del'd Philadelphia | 2.45c. |

*Light Cold-Rolled*

| | |
|---|---|
| No. 20 gage, f.o.b. Pittsburgh | 2.85c. |
| No. 20 gage, f.o.b. Chicago mills | 2.95c. |
| No. 20 gage, del'd Philadelphia | 3.14c. |

*Automobile Body Sheets*

| | |
|---|---|
| No. 20, f.o.b. Pittsburgh | 3.00c. |

*Steel Furniture Sheets*

| | |
|---|---|
| No. 10, f.o.b. Pittsburgh | 2.65c. |
| No. 20, f.o.b. Pittsburgh | 3.25c. |

(Prices on furniture stock include stretcher leveling but not resquaring.)

*Galvanized Sheets*

| | |
|---|---|
| No. 24, f.o.b. Pittsburgh | 2.80c. to 2.90c. |
| No. 24, f.o.b. Chicago mills | 2.90c. to 3.00c. |
| No. 24, del'd Philadelphia | 3.09c. to 3.19c. |
| No. 24, f.o.b. Birmingham | 2.95c. to 3.05c. |
| No. 24, c.i.f. Pacific Coast ports | 3.38c. |

*Long Ternes*

| | |
|---|---|
| No. 24, unassorted, 8-lb. coating, f.o.b. P'gh | 2.90c. to 3.00c. |

*Vitreous Enameling Stock*

| | |
|---|---|
| No. 10, f.o.b. Pittsburgh | 2.75c. |
| No. 20, f.o.b. Pittsburgh | 3.25c. |

*Tin Mill Black Plate*

| | |
|---|---|
| No. 28, f.o.b. Pittsburgh | 2.50c. to 2.60c. |
| No. 28, Chicago mills | 2.60c. to 2.70c. |

### Tin Plate

| | *Base per Box* |
|---|---|
| Standard cokes, f.o.b. P'gh district mills | $4.75 |
| Standard cokes, f.o.b. Gary | 4.85 |

### Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)

(Per Package, 20 x 28 in.)

| | |
|---|---|
| 8-lb. coating I.C. | $9.50 |
| 15-lb. coating I.C. | 12.00 |
| 20-lb. coating I.C. | 13.00 |
| 25-lb. coating I.C. | $14.10 |
| 30-lb. coating I.C. | 14.90 |
| 40-lb. coating I.C. | 16.70 |

### Hot-Rolled Hoops, Bands and Strips

| | *Base per Lb.* |
|---|---|
| 6 in. and narrower, Pittsburgh | 1.55c. to 1.60c. |
| Wider than 6 in., P'gh | 1.45c. to 1.55c. |
| 6 in. and narrower, Chicago | 1.65c. to 1.70c. |
| Wider than 6 in., Chicago | 1.55c. to 1.65c. |
| Cooperage stock, P'gh | 1.60c. to 1.70c. |
| Cooperage stock, Chicago | 1.70c. to 1.80c. |

### Cold-Rolled Strips

| | |
|---|---|
| F.o.b. P'gh | 2.00c. to 2.10c. |
| F.o.b. Cleveland | 2.00c. to 2.10c. |
| F.o.b. del'd Chicago | 2.33c. |
| F.o.b. Worcester | 2.20c. |
| Fender stock, No. 20 gage, Pittsburgh or Cleveland | 2.95c. to 3.00c. |

## STEEL PIPE AND TUBING

### Welded Pipe

**Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills**

*Butt Weld*

| *Steel* Inches | Black | Galv. | *Iron* Inches | Black | Galv. |
|---|---|---|---|---|---|
| ⅛ | 47 | 21½ | ¼ and ⅜ | +11 | +36 |
| ¼ to ⅜ | 53 | 27½ | ½ | 23 | 5 |
| ½ | 58 | 44½ | ¾ | 28 | 11 |
| ¾ | 62 | 50½ | 1 and 1¼ | 31 | 15 |
| 1 to 3 | 64 | 52½ | 1½ and 2 | 35 | 18 |

*Lap Weld*

| | | | | | |
|---|---|---|---|---|---|
| 2 | 57 | 45½ | 2 | 23 | 9 |
| 2½ to 6 | 61 | 49½ | 2½ to 3½ | 28 | 13 |
| 7 and 8 | 58 | 45½ | 4 to 6 | 30 | 17 |
| 9 and 10 | 56 | 43½ | 7 and 8 | 29 | 16 |
| 11 and 12 | 55 | 42½ | 9 to 12 | 26 | 11 |

*Butt Weld, extra strong, plain ends*

| | | | | | |
|---|---|---|---|---|---|
| ⅛ | 43 | 26½ | ¼ and ⅜ | +13 | +48 |
| ¼ to ⅜ | 49 | 32½ | ½ | 23 | 7 |
| ½ | 55 | 44½ | ¾ | 28 | 12 |
| ¾ | 60 | 49½ | 1 to 2 | 34 | 18 |
| 1 to 1½ | 62 | 51½ | | | |
| 2 to 3 | 63 | 52½ | | | |

*Lap Welds, extra strong, plain ends*

| | | | | | |
|---|---|---|---|---|---|
| 2 | 55 | 44½ | 2 | 29 | 13 |
| 2½ to 4 | 59 | 48½ | 2½ to 4 | 34 | 20 |
| 4½ to 6 | 58 | 47½ | 4½ to 6 | 33 | 19 |
| 7 to 8 | 54 | 41½ | 7 and 8 | 31 | 17 |
| 9 and 10 | 47 | 34½ | 9 to 12 | 21 | 8 |
| 11 and 12 | 46 | 33½ | | | |

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discounts of 5 and 2½%, and on galvanized by 1½ points with supplementary discounts of 5 and 2½%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

### Boiler Tubes

**Base Discounts, f.o.b. Pittsburgh**

| *Steel* | | *Charcoal Iron* | |
|---|---|---|---|
| 2 in. and 2¼ in. | 38 | 1½ in. | 1 |
| 2½ in.—2¾ in. | 46 | 1¾ in. | 8 |
| 3 in. | 52 | 2 in.—2¼ in. | 13 |
| 3¼ in.—3¾ in. | 54 | 2½ in.—2¾ in. | 16 |
| 4 in. | 57 | 3 in. | 17 |
| 4½ in. to 6 in. | 46 | 3¼ in. to 3½ in. | 18 |
| | | 4 in. | 20 |
| | | 4½ in. | 21 |

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

*Standard Commercial Seamless Boiler Tubes*

*Cold Drawn*

| | | | |
|---|---|---|---|
| 1 in. | 61 | 3 in. | 46 |
| 1¼ to 1½ in. | 53 | 3¼ to 3½ in. | 48 |
| 1¾ in. | 37 | 4 in. | 51 |
| 2 to 2¼ in. | 32 | 4½, 5 and 6 in. | 40 |
| 2½ to 2¾ in. | 40 | | |

*Hot Rolled*

| | | | |
|---|---|---|---|
| 2 and 2¼ in. | 38 | 3¼ to 3½ in. | 54 |
| 2½ and 2¾ in. | 46 | 4 in. | 57 |
| 3 in. | 52 | 4½, 5 and 6 in. | 46 |

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gages take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

### Seamless Mechanical Tubing

| | *Per Cent Off List* |
|---|---|
| Carbon, 0.10% to 0.30% base (carloads) | 55 |
| Carbon, 0.30% to 0.40% base | 50 |

Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

# Bolts, Nuts, Coke, Coal, Fuel Oil, Cast Iron Pipe

## WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland) (After Dec. 31, extras of 10c. a 100 lb. on mixed and joint carloads, 25c. on pool carloads and 40c. on less than carloads will be applied on all merchant wire products.)

*To Manufacturing Trade*

| | |
|---|---|
| Bright wire | 2.20c. |
| Spring wire | 3.20c. |

*To Jobbing Trade*

| | *Base per Keg* |
|---|---|
| Standard wire nails | $1.95 |
| Smooth coated nails | 1.95 |
| Galvanized nails | 3.90 |

| | *Base per Lb.* |
|---|---|
| Smooth annealed wire | 2.35c. |
| Smooth galvanized wire | 2.80c. |
| Polished staples | 2.50c. |
| Galvanized staples | 2.75c. |
| Barbed wire, galvanized | 2.60c. |

| | |
|---|---|
| Woven wire fence, Nos. 9 and 11 gage, per net ton | $55.00 |
| Woven wire fence, No. 12½ gage and lighter, per net ton | 60.00 |

*Anderson, Ind., mill prices are ordinarily $1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.*

## RAILS AND TRACK SUPPLIES

### Rails

| | *Per Gross Ton* |
|---|---|
| Standard, f.o.b. mill | $43.00 |
| Light (from billets), f.o.b. mill | 34.00 |
| Light (from rail steel), f.o.b. mill | 32.00 |

### Track Equipment

| | *Base per 100 Lb.* |
|---|---|
| Spikes, ⅝-in. and larger | $2.60 |
| Spikes, ½-in. and larger | 2.60 |
| Spikes, boat and barge | 2.80 |
| Tie plate, steel | 1.85 |
| Angle bars | 2.75 |
| Track bolts, to steam railroads | 3.50 |
| Track bolts, to jobbers, all sizes, per 100 count | 73 per cent off list |

## BOLTS, NUTS RIVETS AND SET SCREWS

### Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

| | *Per Cent Off List* |
|---|---|
| †Machine bolts | 73, 10 and 10 |
| †Carriage bolts | 73, 10 and 10 |
| Lag bolts | 73, 10 and 10 |
| Plow bolts, Nos. 1, 2, 3 and 7 heads | 73, 10 and 10 |
| Hot-pressed nuts, blank or tapped, square | 73, 10 and 10 |
| Hot-pressed nuts, blank or tapped, hexagons | 73, 10 and 10 |
| C.p.c. and t. square or hex. nuts, blank or tapped | 73, 10 and 10 |
| Washers* | 7.00c. to 6.75c. per lb. off list |

*F.o.b. Chicago, New York and Pittsburgh.
†Bolts with rolled thread up to and including ⅝ in. x 6 in. take 10 per cent lower list prices.

### Bolts and Nuts

| | *Per Cent Off List* |
|---|---|
| Semi-finished hexagon nuts | 73, 10 and 10 |
| Semi-finished hexagon castellated nuts, S.A.E. | 73, 10 and 10 |
| Stove bolts in packages, P'gh | 80, 25 and 10 |
| Stove bolts in packages, Ch'go | 80, 25 and 10 |
| Stove bolts in pkgs., Cleveland | 80, 25 and 10 |
| Stove bolts in bulk, P'gh | 80, 25, 10 and 2½ |
| Stove bolts in bulk, Ch'go | 80, 25, 10 and 2½ |
| Stove bolts in bulk, Cleveland | 80, 25, 10 and 2½ |
| Tire bolts | 60, 10 and 10 |

Discounts of 73, 10 and 10 per cent off on bolts and nuts apply on carload business with jobbers and large consumers.

### Large Rivets

(½-in. and larger)

| | *Base per 100 Lb.* |
|---|---|
| F.o.b. Pittsburgh or Cleveland | $2.25 |
| F.o.b. Chicago | 2.35 |

### Small Rivets

(⅞-in. and smaller)

| | *Per Cent Off List* |
|---|---|
| F.o.b. Pittsburgh | 70, 10 and 5 |
| F.o.b. Cleveland | 70, 10 and 5 |
| F.o.b. Chicago | 70, 10 and 5 |

### Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

| | *Per Cent Off List* |
|---|---|
| Milled cap screws | 80, 10, 10 and 5 |
| Milled standard set screws, case hardened | 80 and 5 |
| Milled headless set screws, cut thread | 75 and 10 |
| Upset hex. head cap screws, U.S.S.S. thread | 85 and 10 |
| Upset hex. cap screws, S.A.E. thread | 85 and 10 |
| Upset set screws | 80, 10 and 5 |
| Milled studs | 70 |

## SEMI-FINISHED STEEL

### Billets and Blooms

| | *Per Gross Ton* |
|---|---|
| Rerolling, 4-in. and under 10-in., Pittsburgh | $28.00 |
| Rerolling, 4-in. and under 10-in., Youngstown | 28.00 |
| Rerolling, 4-in. and under 10-in., Cleveland | 28.00 |
| Kerolling, 4-in. and under 10-in., Chicago | 31.00 |
| Forging quality, Pittsburgh | 35.00 |

### Sheet Bars

(Open-Hearth or Bessemer)

| | *Per Gross Ton* |
|---|---|
| Pittsburgh | $28.00 |
| Youngstown | 28.00 |
| Cleveland | 28.00 |

### Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

| | *Per Gross Ton* |
|---|---|
| Pittsburgh | $28.00 |
| Youngstown | 28.00 |
| Cleveland | 28.00 |

### Skelp

(F.o.b. Pittsburgh or Youngstown)

| | *Per Lb.* |
|---|---|
| Grooved | 1.50c. to 1.60c. |
| Universal | 1.50c. to 1.60c. |
| Sheared | 1.50c. to 1.60c. |

### Wire Rods

(Common soft, base)

| | *Per Gross Ton* |
|---|---|
| Pittsburgh | $37.00 |
| Cleveland | 37.00 |
| Chicago | 38.00 |

## COKE, COAL AND FUEL OIL

### Coke

| | *Per Net Ton* |
|---|---|
| Furnace, f.o.b. Connellsville prompt | $2.25 to $2.35 |
| Foundry, f.o.b. Connellsville prompt | 3.25 to 4.50 |
| Foundry, by-product, Ch'go ovens | 7.50 |
| Foundry, by-product, New England, del'd | 10.50 |
| Foundry, by-product, Newark or Jersey City, delivered | 8.70 to 9.10 |
| Foundry, by-product, Phila. | $9.00 |
| Foundry, Birmingham | 5.00 |
| Foundry, by-product, St. Louis, f.o.b. ovens | 8.00 |
| Foundry, by-product, del'd St. Louis | 9.00 |

### Coal

| | *Per Net Ton* |
|---|---|
| Mine run steam coal, f.o.b. W. Pa. mines | $1.40 to $1.50 |
| Mine run coking coal, f.o.b. W. Pa. | 1.50 to 1.60 |
| Gas coal, ¾-in., f.o.b. Pa. mines | $1.70 to $1.80 |
| Mine run gas coal, f.o.b. Pa. mines | 1.50 to 1.60 |
| Steam slack, f.o.b. W. Pa. mines | 0.50 to 0.60 |
| Gas slack, f.o.b. W. Pa. mines | 0.65 to 0.75 |

### Fuel Oil

| | *Per Gal. f.o.b. Bayonne, N. J.* |
|---|---|
| No. 3 distillate | 3.50c. |
| No. 4 industrial | 3.00c. |
| | *Per Gal. f.o.b. Baltimore* |
| No. 3 distillate | 3.50c. |
| No. 4 industrial | 3.25c. |

## FLUXES AND REFRACTORIES

### Fluorspar

| | *Per Net Ton* |
|---|---|
| Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines | $13.00 |
| No. 2 lump, Illinois and Kentucky mines | 17.00 |
| Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid | 17.00 |
| Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines | 32.00 |

### Chrome Brick

| | *Per Net Ton* |
|---|---|
| Standard size | $45.00 |

### Fire Clay Brick

| | *Per 1000 f.o.b. Works* | |
|---|---|---|
| | High-Heat Duty Brick | Intermediate Heavy Duty Brick |
| Pennsylvania | $40.00 | $32.00 to $35.00 |
| Maryland | 40.00 | 32.00 to 35.00 |
| New Jersey | $44.00 to 59.00 | ..... |
| Ohio | 40.00 | 32.00 to 35.00 |
| Kentucky | 40.00 | 32.00 to 35.00 |
| Missouri | 37.00 | 32.00 to 35.00 |
| Illinois | 40.00 | 32.00 to 35.00 |
| Ground fire clay, per ton | 6.50 | |

### Silica Brick

| | *Per 1000 f.o.b. Works* |
|---|---|
| Pennsylvania | $40.00 |
| Chicago | 49.00 |
| Birmingham | 50.00 |
| Silica clay, per ton | 8.00 |

### Magnesite Brick

| | *Per Net Ton* |
|---|---|
| Standard sizes, f.o.b. Baltimore and Chester, Pa. | $65.00 |
| Grain magnesite, f.o.b. Baltimore and Chester, Pa. | 40.00 |

## CAST IRON PIPE

| | *Per Net Ton* |
|---|---|
| 6-in. and larger, del'd Chicago | $40.00 to $41.00 |
| 4-in., del'd Chicago | 43.00 to 44.00 |
| 6-in. and larger, del'd New York | $30.90 |
| 4-in., del'd New York | 33.90 |
| 6-in. and larger, Birmingham | $32.00 to 33.00 |
| 4-in., Birmingham | $35.00 to $36.00 |

Class "A" and gas pipe, $3 extra.

# Pig Iron Prices for All Districts

## VALLEY

**Per gross ton, f.o.b. Valley furnace:**

| | |
|---|---|
| Basic | $15.00 |
| Bessemer | $16.00 to 16.50 |
| Gray forge | 15.50 to 16.00 |
| No. 2 foundry | 15.50 to 16.00 |
| No. 3 foundry | 15.00 to 15.50 |
| Malleable | 16.00 to 16.50 |
| Low phos., copper free | 26.66 to 27.00 |

Freight rate to Pittsburgh or Cleveland district, $1.76.

## PITTSBURGH

**Per gross ton, f.o.b. Pittsburgh district furnace:**

| | |
|---|---|
| Basic | $15.50 |
| No. 2 foundry | $16.50 to 17.00 |
| No. 3 foundry | 16.00 to 16.50 |
| Malleable | 16.50 to 17.00 |
| Bessemer | 16.50 to 17.00 |

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

## CHICAGO

**Per gross ton at Chicago furnace:**

| | |
|---|---|
| N'th'n No. 2 fdy. | $16.50 |
| N'th'n No. 1 fdy. | 17.00 |
| Malleable, not over 2.25 sil. | 16.50 |
| High phosphorus | 16.50 |
| Lake Super. charcoal, sil. 1.50, by rail | 22.04 |
| Lake Super. charcoal, sil. 1.50, Chicago docks | 17.00 |
| S'th'n No. 2 fdy. | 17.01 |
| Low phos., sil. 1 to 2, copper free | $28.50 to 29.20 |
| Silvery, sil. 8 per cent | 24.79 |
| Bess. ferrosilicon, 14-15% | 31.29 |

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnaces, not including an average switching charge of 61c. per gross ton.

## ST. LOUIS

**Per gross ton at St. Louis:**

| | |
|---|---|
| No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill. | $17.50 |
| Malleable, f.o.b. Granite City | 17.50 |
| N'th'n No. 2 fdy., del'd St. Louis | 18.66 |
| Southern No. 2 fdy., deliv'd | 15.42 |
| Northern malleable, deliv'd | 18.66 |
| Northern basic, deliv'd | 18.66 |

Freight rates 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

## NEW YORK

**Per gross ton, delivered New York district:**

| | |
|---|---|
| *Buffalo, No. 2, del'd east. N. J. | $17.78 to $18.28 |
| East. Pa. No. 2 fdy. | 16.89 to 17.39 |
| East. Pa. No. 2X fdy. | 17.89 to 18.39 |

Freight rates: $1.39 to $2.52 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

## BUFFALO

**Per gross ton, f.o.b. furnace:**

| | |
|---|---|
| No. 2 fdy. | $16.00 |
| No. 2X fdy. | 16.50 |
| No. 1 fdy. | 17.50 |
| Malleable, sil. up to 2.25 | 16.50 |
| Basic | 15.50 |
| Lake Superior charcoal | 25.28 |

## NEW ENGLAND

**Per gross ton delivered to most New England points:**

| | |
|---|---|
| *Buffalo, sil. 1.75 to 2.25 | $19.91 |
| *Buffalo, sil. 2.25 to 2.75 | 19.91 |
| *Ala., sil. 1.75 to 2.25 | $20.11 to 20.61 |
| *Ala., sil. 2.25 to 2.75 | 20.61 to 21.11 |
| †Ala., sil. 1.75 to 2.25 | 16.75 |
| †Ala., sil. 2.25 to 2.75 | 17.25 |

Freight rates: $4.91 all rail and $4.28 rail and water from Buffalo; $9.61 all rail from Alabama and $5.75 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

## CINCINNATI

**Per gross ton, delivered Cincinnati:**

| | |
|---|---|
| Ala. fdy., sil. 1.75 to 2.25 | $14.69 |
| Ala. fdy., sil. 2.25 to 2.75 | 15.19 |
| Tenn. fdy., sil. 1.75 to 2.25 | 14.69 |
| N'th'n No. 2 foundry | 17.90 |
| S'th'n Ohio silvery, 8 per cent | 21.89 |

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

## PHILADELPHIA

**Per gross ton at Philadelphia:**

| | |
|---|---|
| East. Pa. No. 2 | $15.51 to $16.01 |
| East. Pa. No. 2X | 16.01 to 16.51 |
| East. Pa. No. 1X | 16.51 to 17.01 |
| Basic (del'd east. Pa.) | 16.25 |
| Malleable | 18.00 to 18.50 |
| Stand. low phos. (f.o.b. east. Pa. furnace) | 22.00 to 23.00 |
| Cop. b'r'g low phos. (f.o.b. furnace) | 22.00 to 22.50 |
| Va. No. 2 plain | 22.04 |
| Va. No. 2X | 22.54 |

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

## CLEVELAND

**Per gross ton at Cleveland furnace:**

| | |
|---|---|
| N'th'n No. 2 fdy. (local delivery) | $16.00 |
| S'th'n fdy., sil. 1.75 to 2.25 | 17.01 |
| Malleable (local delivery) | 16.00 |
| Ohio silvery, 8 per cent | 23.00 |
| Stand. low phos., Valley | 27.00 |

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 50c. average local switching charge; $3 from Jackson, Ohio; $6.01 from Birmingham.

## BIRMINGHAM

**Per gross ton, f.o.b. Birmingham dist. furnaces:**

| | |
|---|---|
| No. 2 fdy., 1.75 to 2.25 sil. | $12.00 |
| No. 1 fdy., 2.25 to 2.75 sil. | 12.50 |
| Basic | 12.00 |

## CANADA

**Per gross ton:**

Delivered Toronto

| | |
|---|---|
| No. 1 fdy., sil. 2.25 to 2.75 | $22.60 |
| No. 2 fdy., sil. 1.75 to 2.25 | 22.10 |
| Malleable | 22.60 |

Delivered Montreal

| | |
|---|---|
| No. 1 fdy., sil. 2.25 to 2.75 | $24.00 |
| No. 2 fdy., sil. 1.75 to 2.25 | 23.50 |
| Malleable | 24.00 |
| Basic | $23.00 to 23.50 |

# Prices of Ores and Ferroalloys

### Ores

*Lake Superior Ores, Delivered Lower Lake Ports*

| | *Per Gross Ton* |
|---|---|
| Old range Bessemer, 51.50% iron | $4.80 |
| Old range non-Bessemer, 51.50% iron | 4.65 |
| Mesabi Bessemer, 51.50% iron | 4.65 |
| Mesabi non-Bessemer, 51.50% iron | 4.50 |
| High phosphorus, 51.50% iron | 4.40 |

*Foreign Ore, c.i.f. Philadelphia or Baltimore*

| | *Per Unit* |
|---|---|
| Iron, low phos., copper free, 55 to 58% iron, dry, Spanish or Algerian | 8c. to 8.50c. |
| Iron, low phos., Swedish, aver. 68% iron | 9.00c. |
| Iron, basic or foundry, Swedish, average 65% iron | 8.00c. |
| Iron, basic and foundry, Russian, aver. 63% iron (nom.) | 9.00c. |
| Manganese, Caucasian, washed 52% | 24.00c. |
| Manganese, African, Indian, 50-52% | 23c. to 24c. |
| Manganese, Brazilian, 46 to 48% | 22c. to 23c. |
| Tungsten, Chinese wolframite | $11.00 to $11.25 |
| Tungsten, domestic scheelite | 9.50 to 10.00 |

| | *Per Gross Ton* |
|---|---|
| Chrome, 45% $Cr_2O_3$ crude, c.i.f. Atlantic seaboard | $18.00 |
| Chrome, 48% $Cr_2O_3$, c.i.f. Atlantic seaboard | 20.00 |

### Ferromanganese

| | *Per Gross Ton* |
|---|---|
| Domestic, 80%, seaboard | *$72.00 to $75.00 |
| Foreign, 80%, Atlantic or Gulf port, duty paid | *72.00 to 75.00 |

*Minimum price quoted for lots of 2000 tons or more.

### Spiegeleisen

| | *Per Gross Ton Furnace* |
|---|---|
| Domestic, 19 to 21% | $26.00 to $27.00 |

### Electric Ferrosilicon

| | *Per Gross Ton Delivered* |
|---|---|
| 50% (carloads) | $77.50 |
| 50% (less carload) | 85.00 |
| 75% | 126.00 |

| *Per Gross Ton Furnace* | | *Per Gross Ton Furnace* | |
|---|---|---|---|
| 10% | $35.00 | 12% | $39.00 |
| 11% | 37.00 | 14 to 16% | 31.00 |

### Bessemer Ferrosilicon

**F.o.b. Jackson County, Ohio, Furnace**

| *Per Gross Ton* | | *Per Gross Ton* | |
|---|---|---|---|
| 10% | $22.00 | 13% | $24.50 |
| 11% | 22.50 | 14% | 26.50 |
| 12% | 23.50 | 15% | 28.50 |

### Silvery Iron

**F.o.b. Jackson County, Ohio, Furnace**

| *Per Gross Ton* | | *Per Gross Ton* | |
|---|---|---|---|
| 6% | $19.00 | 11% | $21.50 |
| 7% | 19.50 | 12% | 22.50 |
| 8% | 20.00 | 13% | 23.50 |
| 9% | 20.50 | 14% | 25.50 |
| 10% | 21.00 | 15% | 27.50 |

### Other Ferroalloys

| | |
|---|---|
| Ferrotungsten, per lb. wo. del., carloads | $1.08 |
| Ferrotungsten, less carloads | $1.15 to 1.25 |
| Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads | 10.00c. |
| Ferrochromium, 2% carbon | 17.00c. to 17.50c. |
| Ferrochromium, 1% carbon | 19.00c. to 20.00c. |
| Ferrochromium, 0.10% carbon | 23.50c. to 25.00c. |
| Ferrochromium, 0.06% carbon | 25.50c. to 27.00c. |
| Ferrovanadium, del., per lb. contained Va. | $3.05 to $3.30 |
| Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads | 160.00 |
| Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base per gross ton | 91.00 |
| Ferromolybdenum, per lb. Mo., del. | 1.00 |
| Calcium molybdate, per lb. Mo., del. | 85c. |
| Ferrophosphorus, electric, 24%, f.o.b. Anniston, Ala., per gross ton | $122.50 |
| Silico spiegel, per ton, f.o.b. furnace, car lots | 42.50 |
| Ton lots or less, per ton | 47.50 |
| Silico-manganese, gross ton, delivered: 2.50% carbon grade | 105.00 |
| 1% carbon grade | 115.00 |
| Spot prices | $5 a ton higher |

# Old Material Quotations

## PITTSBURGH

**Per gross ton delivered consumers' yards:**

| | | |
|---|---|---|
| No. 1 heavy melting steel. | $10.00 to | $10.50 |
| No. 2 heavy melting steel. | 9.00 to | 9.50 |
| No. 2 railroad wrought.. | 10.00 to | 10.50 |
| Scrap rails | 10.00 to | 10.50 |
| Rails 3 ft. and under.... | 12.00 to | 12.50 |
| Sheet bar crops, ordinary. | 11.00 to | 11.50 |
| Compressed sheet steel... | 9.75 to | 10.25 |
| Hand bundled sheet steel. | 9.00 to | 9.50 |
| Hvy. steel axle turnings.. | 9.00 to | 9.50 |
| Machine shop turnings... | 6.50 to | 7.00 |
| Short shov. steel turnings. | 6.50 to | 7.00 |
| Short mixed borings and turnings | 6.50 to | 7.00 |
| Cast iron borings | 6.50 to | 7.00 |
| Cast iron carwheels | 10.50 to | 11.00 |
| Heavy breakable cast.... | 8.00 to | 8.50 |
| No. 1 cast | 9.50 to | 10.50 |
| Railr. knuckles and couplers | 10.50 to | 11.50 |
| Rail. coil and leaf springs | 10.50 to | 11.50 |
| Rolled steel wheels | 10.50 to | 11.50 |
| Low phos. billet crops... | 13.00 to | 13.50 |
| Low phos. sheet bar crops | 12.50 to | 13.00 |
| Low phos. plate scrap.... | 10.00 to | 11.50 |
| Low phos. punchings..... | 11.00 to | 12.00 |
| Steel car axles | 15.00 to | 15.50 |

## CHICAGO

**Delivered Chicago district consumers:**

*Per Gross Ton*

| | | |
|---|---|---|
| Heavy melting steel | $7.50 to | $8.00 |
| Shoveling steel | 7.50 to | 8.00 |
| Frogs, switches and guards | 7.50 to | 8.00 |
| Factory hyd. comp. sheets | 5.75 to | 6.25 |
| Drop forge flashings | 5.00 to | 5.50 |
| No. 1 busheling | 5.50 to | 6.00 |
| Rolled carwheels | 8.00 to | 9.00 |
| Railroad tires | 9.00 to | 9.50 |
| Railroad leaf springs | 8.50 to | 9.00 |
| Axle turnings | 5.75 to | 6.25 |
| Steel couplers and knuckles | 8.25 to | 8.75 |
| Coil springs | 9.50 to | 10.00 |
| Axle turnings (elec. fur.). | 6.00 to | 6.50 |
| Low phos. punchings | 10.00 to | 10.50 |
| Low phos. plates, 12 in. and under | 9.00 to | 9.50 |
| Cast iron borings | 3.50 to | 4.00 |
| Short shoveling turnings.. | 4.00 to | 4.50 |
| Machine shop turnings | 4.00 to | 4.50 |
| Rerolling rails | 10.50 to | 11.00 |
| Steel rails, less than 3 ft.. | 9.25 to | 9.75 |
| Steel rails, less than 2 ft.. | 10.00 to | 10.50 |
| Angle bars, steel | 8.25 to | 8.75 |
| Cast iron carwheels | 8.50 to | 9.00 |
| Railroad malleable | 7.00 to | 7.50 |
| Agricultural malleable | 7.00 to | 7.50 |
| *Relaying rails, 56 to 60 lb. | 19.00 to | 21.00 |
| *Relay. rails, 65 lb. and up | 22.00 to | 27.00 |

*Per Net Ton*

| | | |
|---|---|---|
| Iron angle and splice bars | 7.00 to | 7.50 |
| Iron arch bars, transoms.. | 7.50 to | 8.00 |
| Iron car axles | 13.50 to | 14.50 |
| Steel car axles | 10.50 to | 11.00 |
| No. 1 railroad wrought... | 6.50 to | 7.00 |
| No. 2 railroad wrought... | 6.50 to | 7.00 |
| No. 1 busheling | 5.00 to | 5.50 |
| No. 2 busheling | 2.50 to | 3.00 |
| Locomotive tires, smooth.. | 8.00 to | 9.00 |
| Pipes and flues | 3.25 to | 3.75 |
| No. 1 machinery cast | 8.50 to | 9.00 |
| Clean automobile cast.... | 7.50 to | 8.00 |
| No. 1 railroad cast | 7.00 to | 7.50 |
| No. 1 agricultural cast.... | 7.00 to | 7.50 |
| Stove plate | 6.25 to | 6.75 |
| Grate bars | 5.50 to | 6.00 |
| Brake shoes | 5.75 to | 6.25 |

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

## PHILADELPHIA

**Per gross ton delivered consumers' yards:**

| | | |
|---|---|---|
| No. 1 heavy melting steel. | $7.00 to | $8.00 |
| No. 2 heavy melting stel.. | 6.00 to | 6.50 |
| No. 1 railroad wrought... | 9.50 to | 10.00 |
| Bundled sheets | | 6.00 |
| Hydraulic compressed, new | 7.00 to | 7.50 |
| Hydraulic compressed, old. | 6.00 to | 6.50 |
| Machine shop turnings.... | | 4.50 |
| Heavy axle turnings | 7.00 to | 8.00 |
| Cast borings (nom.) | | 3.50 |
| Heavy breakable cast.... | | 9.00 |
| Stove plate (steel works). | | 7.00 |
| No. 1 low phos. hvy | 11.00 to | 12.00 |
| Couplers and knuckles.... | 10.00 to | 10.50 |
| Rolled steel wheels | 9.50 to | 10.00 |
| No. 1 blast furnace | | 3.50 |
| Spec. iron and steel pipe.. | | 10.50 |
| Shafting | 15.00 to | 15.50 |
| Steel axles | 15.00 to | 15.50 |
| No. 1 forge fire | 6.75 to | 7.25 |
| Cast iron carwheels | 11.50 to | 12.00 |
| No. 1 cast | 10.00 to | 10.50 |
| Cast borings (chem.) | 11.50 to | 12.00 |
| Steel rails for rolling | | 10.50 |

## CLEVELAND

**Per gross ton delivered consumers' yards:**

| | | |
|---|---|---|
| No. 1 heavy melting steel.. | $7.50 to | $8.00 |
| No. 2 heavy melting steel.. | 6.75 to | 7.25 |
| Compressed sheet steel... | 7.00 to | 7.25 |
| Light bundled sheet stampings | 6.00 to | 6.50 |
| Drop forge flashings | 6.00 to | 6.25 |
| Machine-shop turnings | 4.50 to | 4.75 |
| Short shoveling turnings.. | 5.75 to | 6.25 |
| No. 1 busheling | 6.50 to | 6.75 |
| Steel axle turnings | 7.50 to | 8.00 |
| Low phos., billet crops | 14.00 to | 14.50 |
| Cast iron borings | 4.50 to | 4.75 |
| Mixed borings and short turnings | 4.50 to | 4.75 |
| No. 2 busheling | 4.50 to | 4.75 |
| No. 1 cast | 9.00 to | 9.50 |
| Railroad grate bars | 6.00 to | 6.50 |
| Stove plate | 6.00 to | 6.50 |
| Rails under 3 ft. | 15.00 to | 15.50 |
| Rails for rolling | 13.00 to | 13.50 |
| Railroad malleable | 11.00 to | 11.25 |

## BUFFALO

**Per gross ton, f.o.b. Buffalo consumers' plants:**

| | | |
|---|---|---|
| No. 1 heavy melting steel.. | | $8.00 |
| No. 2 heavy melting scrap. | 6.50 to | 7.50 |
| Scrap rails | 8.00 to | 8.50 |
| New hydraul. comp. sheets | | 6.50 |
| Old hydraul. comp. sheets. | | 5.50 |
| Drop forge flashings | | 6.50 |
| No. 1 busheling | 6.50 to | 7.00 |
| Hvy. steel axle turnings... | 8.00 to | 8.50 |
| Machine shop turnings.... | 4.50 to | 5.00 |
| Knuckles and couplers.... | | 10.00 |
| Coil and leaf springs.... | | 10.00 |
| Rolled steel wheels..... | | 10.00 |
| Low phos. billet crops.... | 12.50 to | 13.00 |
| Short shov. steel turnings.. | 7.00 to | 7.50 |
| Short mixed borings and turnings | 6.00 to | 6.50 |
| Cast iron borings | 6.00 to | 6.50 |
| No. 2 busheling | 4.50 to | 5.00 |
| Steel car axles | 10.00 to | 11.00 |
| Iron axles | 12.00 to | 12.50 |
| No. 1 machinery cast.... | 10.00 to | 10.50 |
| Stove plate | 8.25 to | 8.50 |
| Steel rails, 3 ft. and under | 12.00 to | 12.50 |
| Cast iron carwheels | 9.00 to | 9.50 |
| Industrial malleable | 9.50 to | 10.00 |
| Railroad malleable | 9.50 to | 10.00 |
| Chemical borings | 9.00 to | 9.50 |

## BIRMINGHAM

**Per gross ton delivered consumers' yards:**

| | | |
|---|---|---|
| Heavy melting steel | $8.50 to | $9.00 |
| Scrap steel rails | | 9.00 |
| Short shoveling turnings.. | 3.50 to | 4.00 |
| Stove plates | | 6.00 |
| Steel axles | | 12.00 |
| Iron axles | | 12.00 |
| No. 1 railroad wrought | | 6.00 |
| Rails for rolling | 9.00 to | 9.50 |
| No. 1 cast | | 9.00 |
| Tramcar wheels | 9.00 to | 10.00 |
| Cast iron borings, chem | 10.00 to | 11.00 |

## ST. LOUIS

**Dealers' buying prices per gross ton:**

| | | |
|---|---|---|
| Selected heavy steel | $7.00 to | $7.50 |
| No. 1 heavy melting | 6.50 to | 7.00 |
| No. 2 heavy melting | 6.25 to | 6.75 |
| No. 1 locomotive tires | 8.00 to | 8.50 |
| Misc. stand-sec. rails | 8.00 to | 8.50 |
| Railroad springs | 8.50 to | 9.00 |
| Bundled sheets | 4.25 to | 4.75 |
| No. 2 railroad wrought... | 6.50 to | 7.00 |
| No. 1 busheling | 6.00 to | 6.50 |
| Cast iron borings and shoveling turnings | 4.75 to | 5.25 |
| Iron rails | 7.00 to | 8.00 |
| Rails for rolling | 9.50 to | 10.00 |
| Machine shop turnings.... | 3.00 to | 3.50 |
| Heavy turnings | 5.50 to | 6.00 |
| Steel car axles | 10.00 to | 10.50 |
| Iron car axles | 14.00 to | 14.50 |
| Wrot. iron bars and trans. | 5.00 to | 5.50 |
| No. 1 railroad wrought.... | 4.75 to | 5.25 |
| Steel rails, less than 3 ft... | 10.00 to | 10.50 |
| Steel angle bars | 6.75 to | 7.25 |
| Cast iron carwheels | 6.50 to | 7.00 |
| No. 1 machinery cast | 8.00 to | 8.50 |
| Railroad malleable | 5.00 to | 5.50 |
| No. 1 railroad cast | 6.25 to | 6.75 |
| Stove plate | 6.00 to | 6.50 |
| Relay. rails, 60 lb. and under | 16.00 to | 16.50 |
| Relay. rails, 70 lb. and over | 20.00 to | 21.00 |
| Agricult. malleable | 5.00 to | 5.50 |

## NEW YORK

**Dealers' buying prices per gross ton:**

| | | |
|---|---|---|
| No. 1 heavy melting steel.. | $4.25 to | $5.50 |
| Heavy melting steel (yard) | 2.75 to | 3.00 |
| No. 1 hvy. breakable cast.. | 5.00 to | 5.50 |
| Stove plate (steel works).. | 3.00 to | 3.50 |
| Machine shop turnings.... | 1.75 to | 2.00 |
| Short shoveling turnings.. | 1.75 to | 2.00 |
| Cast borings | 1.25 to | 1.50 |
| No. 1 blast furnace | 1.25 to | 1.50 |
| Steel car axles | 10.00 to | 10.50 |
| Iron car axles (nom.) | 14.00 to | 14.50 |
| Spec. iron and steel pipe... | | 5.00 |
| Forge fire | | 3.25 |
| No. 1 railroad wrought... | 5.00 to | 5.25 |
| No. 1 yard wrought, long.. | 4.00 to | 4.25 |
| Rails for rolling | 6.00 to | 6.25 |
| Stove plate (foundry) | 4.75 to | 5.25 |
| Malleable cast (railroad).. | 6.00 to | 6.50 |
| Cast borings (chemical).. | 8.00 to | 8.50 |

**Per gross ton, delivered local foundries:**

| | |
|---|---|
| No. 1 machinery cast | $8.50 |
| No. 1 hvy. cast (cupola size) | 6.50 |
| No. 2 cast | 5.50 |

## BOSTON

**Dealers' buying prices per gross ton:**

| | | |
|---|---|---|
| No. 1 heavy melting steel.. | $3.80 to | $4.60 |
| Scrap T rails | 3.80 to | 4.60 |
| Machine shop turnings | | 1.05 |
| Cast iron borings | | 1.05 |
| Bundled skeleton, long | 3.00 to | 3.25 |
| Forge flashings | 3.00 to | 3.50 |
| Blast furnace scrap | | 1.05 |
| Forge scrap | 3.00 to | 3.25 |
| Shafting | 9.50 to | 10.00 |
| Steel car axles | 9.00 to | 9.50 |
| Wrought pipe | 4.00 to | 4.25 |
| Rails for rolling | 6.00 to | 6.50 |
| Cast iron borings, chemical | 7.00 to | 7.25 |

**Per gross ton delivered consumers' yards:**

| | | |
|---|---|---|
| Textile cast | $8.75 to | $9.25 |
| No. 1 machinery cast | 8.75 to | 9.25 |
| Stove plate | 5.00 to | 5.25 |
| Railroad malleable | 10.50 to | 11.00 |

## CINCINNATI

**Dealers' buying prices per gross ton:**

| | | |
|---|---|---|
| Heavy melting steel | $6.00 to | $7.00 |
| Scrap rails for melting | 8.00 to | 8.50 |
| Loose sheet clippings | 2.75 to | 3.25 |
| Bundled sheets | 4.75 to | 5.25 |
| Cast iron borings | 2.75 to | 3.25 |
| Machine shop turnings | 3.25 to | 3.75 |
| No. 1 busheling | 4.25 to | 4.75 |
| No. 2 busheling | 2.50 to | 3.00 |
| Rails for rolling | 9.00 to | 9.50 |
| No. 1 locomotive tires | 8.50 to | 9.00 |
| Short rails | 11.75 to | 12.25 |
| Cast iron carwheels | 8.25 to | 8.75 |
| No. 1 machinery cast | 10.00 to | 10.50 |
| No. 1 railroad cast | 8.75 to | 9.25 |
| Burnt cast | 4.25 to | 4.75 |
| Stove plate | 4.25 to | 4.75 |
| Agricultural malleable | 8.00 to | 8.50 |
| Railroad malleable | 9.00 to | 9.50 |

## DETROIT

**Dealers' buying prices per gross ton:**

| | | |
|---|---|---|
| Hvy. melting | $5.50 to | $6.00 |
| Borings and short turnings | 3.25 to | 3.75 |
| Long turnings | 3.00 to | 3.50 |
| No. 1 machinery cast | 8.50 to | 9.00 |
| Automotive cast | 10.75 to | 11.25 |
| Hydraul. comp. sheets | 5.50 to | 6.00 |
| Stove plate | 4.50 to | 5.00 |
| New No. 1 busheling | 4.75 to | 5.25 |
| Old No. 2 busheling | 3.00 to | 3.50 |
| Sheet clippings | 3.50 to | 4.00 |
| Flashings | 4.75 to | 5.25 |

## CANADA

**Dealers' buying prices per gross ton:**

| | Toronto | Montreal |
|---|---|---|
| Heavy melting steel | $7.00 | $6.00 |
| Rails, scrap | 7.00 | 6.00 |
| No. 1 wrought | 6.00 | 8.00 |
| Machine shop turnings | 2.00 | 2.00 |
| Boiler plate | 5.00 | 4.50 |
| Heavy axle turnings | 2.50 | 2.50 |
| Cast borings | 2.00 | 2.00 |
| Steel borings | 2.00 | 2.00 |
| Wrought pipe | 2.00 | 2.00 |
| Steel axles | 7.00 | 9.00 |
| Axles, wrought iron | 7.00 | 11.00 |
| No. 1 machinery cast | 12.50 | 10 00 |
| Stove plate | 10.00 | 8.00 |
| Standard carwheels | 11.00 | 8 50 |
| Malleable | 10.00 | 8.00 |

# Warehouse Prices for Iron and Steel Products

## CHICAGO

| | Base per Lb. |
|---|---|
| Plates and structural shapes | 3.00c. |
| Soft steel bars | 2.75c. |
| Reinforcing bars, billet steel | 1.50c. to 1.80c. |
| Rail steel reinforcement— | |
| For buildings | 1.30c. to 1.55c. |
| Road slabs, bridges, culverts | 1.40c. |
| Cold-fin. steel bars and shafting— | |
| Rounds and hexagons | 3.10c. |
| Flats and squares | 3.60c. |
| Bands, ⅞ in. (in Nos. 10 and 12 gages) | 2.95c. |
| Hoops (No. 14 gage and lighter) | 3.50c. |
| Hot-rolled annealed sheets (No. 24) | 3.55c. |
| Galv. sheets (No. 24) | 4.10c. |
| Hot-rolled sheets (No. 10) | 3.20c. |
| Spikes (⅞ in. and larger) | 3.45c. |
| Track bolts | 4.30c. |
| Rivets, structural | 4.00c. |
| Rivets, boiler | 4.00c. |
| | Per Cent Off List |
| Machine bolts | 73 |
| Carriage bolts | 73 |
| Coach and lag screws | 73 |
| Hot-pressed nuts, sq., tap. or blank | 73 |
| Hot-pressed nuts, hex., tap. or blank | 73 |
| No. 8 black ann'l'd wire, per 100 lb. | $3.45 |
| Com. wire nails, base per keg | 2.30 |
| Cement c't'd nails, base per keg | 2.30 |

## CLEVELAND

| | Base per Lb. |
|---|---|
| Plates and struc. shapes | 2.95c. |
| Soft steel bars | 2.75c. |
| Reinforc. steel bars | 1.75c. to 1.95c. |
| Cold-fin. rounds and hex | 3.10c. |
| Cold-fin. flats and sq. | 3.60c. |
| Hoops and bands, No. 12 to ⅞ in., inclusive | 3.00c. |
| Hoops and bands, No. 13 and lighter | 3.55c. |
| Cold-finished strip | *5.55c. |
| Hot-rolled annealed sheets (No. 24) | 3.60c. |
| Galvanized sheets (No. 24) | 3.75c. |
| Hot-rolled sheets (No. 10) | 3.00c. |
| No. 9 ann'l'd wire, per 100 lb. | $2.25 |
| No. 9 galv. wire, per 100 lb. | 2.70 |
| Com. wire nails, base per keg | 2.25 |

*Net base, including boxing and cutting to length.

## CINCINNATI

| | Base per Lb. |
|---|---|
| Plates and struc. shapes | 3.25c. |
| Bars, soft steel or iron | 3.00c. |
| New billet reinforc. bars | 3.00c. |
| Rail steel reinforc. bars | 3.00c. |
| Hoops | 3.90c. |
| Bands | 3.20c. |
| Cold-fin. rounds and hex | 3.50c. |
| Squares | 4.00c. |
| Hot-rolled annealed sheets (No. 24) | 2.75c. |
| Galv. sheets (No. 24) | 4.25c. |
| Hot-rolled sheets (No. 10) | 3.30c. |
| Structural rivets | 4.20c. |
| Small rivets | 60 per cent off list |
| No. 9 ann'l'd wire, per 100 lb. | $3.00 |
| Com. wire nails, base per keg (10 to 49 kegs) | 2.65 |
| Larger quantities | 2.50 |
| Cement c't'd nails, base 100-lb. keg | 2.95 |
| Chain, per 100 lb. | 10.25 |
| | Net per 100 Ft. |
| Seamless steel boiler tubes, 2-in. | $17.50 |
| 4-in. | 36.00 |
| Lap-welded steel boiler tubes, 2-in. | 16.50 |
| 4-in. | 34.50 |

## BUFFALO

| | Base per Lb. |
|---|---|
| Plates and struc. shapes | 3.25c. |
| Soft steel bars | 3.00c. |
| Reinforcing bars | 2.65c. |
| Cold-fin. flats and sq. | 3.65c. |
| Rounds and hex | 3.15c. |
| Cold-rolled strip steel | 5.25c. |
| Hot-rolled annealed sheets (No. 24) | 3.70c. |
| Galv. sheets (No. 24) | 4.10c. |
| Bands | 3.35c. |
| Hoops | 3.90c. |
| Hot-rolled sheets (No. 10) | 3.50c. |
| Com. wire nails, base per keg | $2.45 |
| Black wire, base per 100 lb. | 3.20 |

## NEW YORK

| | Base per Lb. |
|---|---|
| Plates and struc. shapes | 2.70c. to 3.10c. |
| Soft steel bars, small shapes | 2.70c. to 3.10c. |
| Iron bars | 3.24c. |
| Iron bars, Swed. charcoal | 7.00c. to 7.25c. |
| Cold-fin. shafting and screw stock: | |
| Rounds and hexagons | 3.40c. |
| Flats and squares | 3.90c. |
| Cold-roll. strip, soft and quarter hard | 4.95c. |
| Hoops | 3.75c. |
| Bands | 3.40c. |
| Hot-rolled sheets (No. 10) | 3.00c. to 3.25c. |
| Hot-rolled ann'l'd sheets (No. 24*) | 3.60c. |
| Galvanized sheets (No. 24*) | 4.00c. |
| Long terne sheets (No. 24) | 5.00c. |
| Standard tool steel | 12.00c. |
| Wire, black annealed (No. 10) | 3.60c. |
| Wire, galv. annealed (No. 10) | 4.05c. |
| Common wire nails, base, per keg | $2.50 |
| Tire steel, ½ x ½ in. and larger | 3.40c. |
| Smooth finish, 1 to 2½ x ¼ in. and larger | 3.75c. |
| Open-hearth spring steel, bases, | 4.50c. to 7.00c. |

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

| | Per Cent Off List |
|---|---|
| Machine bolts, cut thread: | |
| ¾ x 6 in. and smaller | 65 to 65 and 10 |
| 1 x 30 in. and smaller | 65 to 65 and 10 |
| Carriage bolts, cut thread: | |
| ½ x 6 in. and smaller | 65 to 65 and 10 |
| ¾ x 20 in. and smaller | 65 to 65 and 10 |
| Boiler Tubes: | Per 100 Ft. |
| Lap welded, 2-in. | $19.00 |
| Seamless steel, 2-in. | 20.25 |
| Charcoal iron, 2-in. | 26.25 |
| Charcoal iron, 4-in. | 67.00 |

## ST. LOUIS

| | Base per Lb. |
|---|---|
| Plates and struc. shapes | 3.25c. |
| Bars, soft steel or iron | 3.00c. |
| Cold-fin. rounds, shafting, screw stock | 3.35c. |
| Hot-rolled annealed sheets (No. 24) | 3.80c. |
| Galv. sheets (No. 24) | 4.35c. |
| Hot-rolled sheets (No. 10) | 3.45c. |
| Black corrug. sheets (No. 24) | 3.85c. |
| Galv. corrug. sheets | 4.40c. |
| Structural rivets | 4.00c. |
| Boiler rivets | 4.00c. |
| | Per Cent Off List |
| Tank rivets, ⅞-in. and smaller, 100 lb. or more | 65 |
| Less than 100 lb. | 60 |
| Machine bolts | 73 |
| Carriage bolts | 73 |
| Lag screws | 73 |
| Hot-pressed nuts, sq., blank or tapped, 200 lb. or more | 73 |
| Less than 200 lb. | 63 |
| Hot-pressed nuts, hex., blank or tapped, 200 lb. or more | 73 |
| Less than 200 lb. | 63 |

## PACIFIC COAST

| | Base per Lb. | | |
|---|---|---|---|
| | San Francisco | Los Angeles | Seattle |
| Plates and struc. shapes, ¼-in. and heavier | 2.80c. | 3.00c. | 2.50c. |
| Soft steel bars | 2.80c. | 3.00c. | 2.50c. |
| Reinforcing bars | 2.80c. | 2.80c. | 3.00c. |
| Hot-rolled annealed sheets (No. 24) | 3.90c. | 4.00c. | 4.00c. |
| Hot-rolled sheets (No. 10) | 3.40c. | 3.50c. | 3.50c. |
| Galv. sheets (No. 24) | 4.40c. | 4.20c. | 4.50c. |
| Struc. rivets, ½ in. and larger, less than 1000 lb. | 5.00c. | 5.00c. | 5.50c. |
| Common wire nails, base per keg in less carloads | $2.75 | $2.75 | $2.75 |
| Cement c't'd nails, 100-lb. keg | 2.65 | 2.70 | 2.65 |

San Francisco and Los Angeles schedule subject to allowance of 10c. per 100 lb. for 5000 lb. or over.

Seattle schedule subject to allowance of 25c. per 100 lb. for 500 lb. or over.

## PITTSBURGH

| | *Base per Lb. |
|---|---|
| Plates | 2.85c. |
| Structural shapes | 2.85c. |
| Soft steel bars and small shapes | 2.60c. |
| Reinforcing steel bars | 2.60c. |
| Cold-finished and screw stock— | |
| Rounds and hexagons | 3.10c. |
| Squares and flats | 3.60c. |
| Bands | 2.95c. |
| Hoops | 3.60c. |
| Hot-rolled annealed sheets (No. 24), 25 or more bundles | 3.05c. |
| Galv. sheets (No. 24), 25 or more bundles | 3.65c. |
| Hot-rolled sheets (No. 10) | 3.15c. to 3.20c. |
| Galv. corrug. sheets (No. 28), per square (less than 3750 lb.) | 3.74c. |
| Spikes, large | 2.50c. |
| Small | 2.75c. to 2.90c. |
| Boat | 3.00c. |
| Track bolts, all sizes, per 100 count, | 70 and 10 per cent off list |
| Machine bolts, 100 count, | 70 and 10 per cent off list |
| Carriage bolts, 100 count, | 70 and 10 per cent off list |
| Nuts, all styles, 100 count, | 73 and 10 per cent off list |
| Large rivets, base per 100 lb. | $3.00 |
| Wire, black, soft ann'l'd, base per 100 lb. | 2.30 |
| Wire, galv. soft, base per 100 lb. | 2.75 |
| Common wire nails, per keg | 2.25 |
| Cement coated nails, per keg | 2.25 |

*On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 999 lb.

## PHILADELPHIA

| | Base per Lb. |
|---|---|
| Plates, ¼-in. and heavier | 2.50c. |
| Structural shapes | 2.50c. |
| Soft steel bars, small shapes, iron bars (except bands) | 2.60c. |
| Reinforc. steel bars, sq., twisted and deform. | 2.30c. |
| Cold-fin. steel, rounds and hex. | 3.30c. |
| Cold-fin. steel, sq. and flats | 3.80c. |
| Steel hoops | 3.15c. |
| Steel bands, No. 12 to ⅞-in., inclu. | 2.90c. |
| Spring steel | 5.00c. |
| Hot-rolled box annealed sheets (No. 24) | 3.55c. |
| Galvanized sheets (No. 24) | 4.00c. |
| Hot-rolled blue annealed sheets (No. 10) | 3.05c. |
| Diam. pat. floor plates, ¼ in. | 5.10c. |
| Swedish iron bars | 6.60c. |

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

## BOSTON

| | Base per Lb. |
|---|---|
| Plates | *3.35c. |
| Structural shapes | *3.35c. |
| Soft steel bars, small shapes | *3.25c. |
| Reinforcing bars | 3.10c. to 3.25c. |
| Iron bars— | |
| Refined | 3.25c. |
| Best refined | 4.60c. |
| Spring steel, open-hearth | 5.00c. |
| Tire steel | 4.50c. to 4.75c. |
| Bands | *3.75c. to 4.25c. |
| Hoop steel | 4.90c. to 5.40c. |
| Cold-rolled steel— | |
| Rounds and hex | 3.50c. to 5.50c. |
| Squares and flats | 4.00c. to 6.00c. |
| Rivets, structural or boiler | 4.80c. |
| | Per Cent Off List |
| Machine bolts | 70 |
| Carriage bolts | 70 |
| Lag screws | 70 |
| Hot-pressed nuts | 40 and 10 |
| Cold-punched nuts | 40 and 10 |
| Stove bolts | 70 and 10 |

*Base price (250 to 999 lb.); less than 250 lb., add 50c. per 100 lb.; 1000 to 7999 lb., deduct 15c.; 8000 to 14,999 lb., deduct 25c.; 15,000 lb. and larger lots, deduct 35c.

# Fabricated Structural Steel

## Awards of 36,000 Tons, Largest Since September, Include Post Office and Elevated Highway—Projects Small

AWARDS of fabricated structural steel total more than 36,000 tons, the largest in any week since September, and more than twice the total of a week ago. Most of the week's business is contributed by two contracts—a Post Office in Pittsburgh, 15,000 tons, and a section of New York's elevated highway, 12,000 tons. A subway in Newark, N. J., calls for 2250 tons.

New fabricated steel projects of 11,000 tons are about half the total of a week ago and compare with 13,500 tons two weeks ago. A bascule bridge in Chicago, an apartment building and store in Indianapolis, and a power plant at Fort Washington, Wis., require 2000 tons each. Awards follow:

NORTH ATLANTIC STATES

**Portland, Me.,** 500 tons, New England Telephone & Telegraph Co. exchange, to McClintic-Marshall Corpn.

**Dolgeville, N. Y.,** 210 tons, State highway bridge, to Lackawanna Steel Construction Co.; M. R. Ingraham, general contractor.

**New York,** 12,000 tons, West Side elevated highway, West Twenty-second to West Thirtieth Street, to McClintic-Marshall Corpn.; Poirier McLane Corpn., general contractor.

**Newark, N. J.,** 2250 tons, subway section No. 2, to McClintic-Marshall Corpn.; J. Rich Steers, Inc., general contractor.

**Shaler, Pa.,** 150 tons, high school, to Gulbert Steel Co.

**Buffalo,** 150 tons, warehouse for Westinghouse Electric & Mfg. Co., to McClintic-Marshall Corpn.

**Trenton, N. J.,** 300 tons, municipal terminal, to Belmont Iron Works.

**Glenshaw, Pa.,** 225 tons, school, to Gulbert Steel Co.

**Pittsburgh,** 15,000 tons, post office, to Fort Pitt Bridge Works Co.

**Pittsburgh,** 380 tons, Carson Street bridge, to McClintic-Marshall Corpn.

CENTRAL STATES

**Whiting, Ind.,** 210 tons, cracking furnace and reducing furnace for M. W. Kellogg Co., to McClintic-Marshall Corpn.

**Nickel Plate Railroad,** 300 tons, repairs to viaduct at Cleveland, to American Bridge Co.

**Chicago,** 1000 tons, Cass Street bascule, Division of Waterways, to Independent Bridge Co.

THE SOUTH

**State of Georgia,** 325 tons, highway bridge, to an unnamed fabricator.

CENTRAL STATES

**Shoals, Ind.,** 535 tons, highway bridge, to Vincennes Bridge Co.

**Cleveland,** 150 tons, warehouse for Goodyear Tire & Rubber Co., to Berger Iron Works.

**Chicago & Northwestern Railroad,** 450 tons, bridge work, to American Bridge Co.

**State of Missouri,** 1200 tons, bridges to various fabricators.

**State of Illinois,** 600 tons, highway bridge, to Illinois Steel Bridge Co.

**Milwaukee Road,** 125 tons, bridge, to American Bridge Co.

### NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

**New York,** 525 tons, St. Francis Xavier School in Bronx.

**Brooklyn,** 800 tons, nurses' club house on Greene Avenue.

**Lancaster, Pa.,** 250 tons, filtration plant.

SOUTH AND SOUTHWEST

**New Orleans,** 720 tons, Poland Street wharf for Port of New Orleans, American Bridge Co. low bidder.

**Texarkana, Ark.-Tex.,** 600 tons, post office.

**Atlanta, Ga.,** 2200 tons, post office; opening of bids postponed from Dec. 28 to Jan. 12.

CENTRAL STATES

**State of Ohio,** 115 tons, highway bridge in Clark County.

**Youngstown, Ohio,** 600 tons, post office; bids taken.

**Cincinnati,** 200 tons, landing stage.

**Chicago,** 2000 tons, bascule bridge for Lincoln Park Commission.

**State of Illinois,** 600 tons, State hospital.

**Indianapolis,** 2000 tons, apartment building and store.

**Port Washington, Wis.,** 2000 tons, power plant for Milwaukee Electric Light & Railway Co.

**Joliet, Ill.,** 1300 tons, two State bridges.

**State of Ohio,** 600 tons, bridge work for State Highway Department.

WESTERN STATES

**Martinez, Cal.,** 650 tons, County Hall of Records; Golden Gate Iron Works low bidder.

FABRICATED PLATE

NEW PROJECTS

**Kansas City, Mo.,** 600 tons, pontoons; bids to be opened Jan. 4 by United States District Engineer.

**St. Nicholas, Pa.,** 350 tons, chutes and bins for coal breaker; General contractor Connery & Co., Philadelphia.

AWARDS

**Philadelphia,** 8000 tons, two railroad car transports for Seatrains, Inc., placed by Sun Shipbuilding & Dry Dock Co. with Worth Steel Co., Lukens Steel Co., Carnegie Steel Co. and Bethlehem Steel Co.

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# Reinforcing Steel

## Awards 2135 Tons—New Projects 1940 Tons

AWARDS

**New York Central Railroad,** 310 tons, viaduct, West Eighteenth Street to Thirtieth Street, to Joseph T. Ryerson & Son, Inc.

**New York,** 120 tons, sewer project, Fifty-ninth Street and Tenth Avenue, to Concrete Steel Co.

**State of Illinois,** 200 tons, paving, to Concrete Engineering Co.

**Lyons, Ill.,** 280 tons, highway bridge across Des Plaines River, to Concrete Steel Co.

**Phoenix, Ariz.,** 150 tons, sewage disposal plant, to Soule Steel Co.

**Los Angeles,** 363 tons, Wadsworth Veterans' Hospital, to Concrete Engineering Co.

**Los Angeles,** 100 tons, hospital at Sixty-sixth and Crenshaw Streets, to Blue Diamond Corpn.

**Beverly Hills, Cal.,** 130 tons, roof for reservoir, to Soule Steel Co.

**Bakersfield, Cal.,** 100 tons, Kress Building, to Concrete Engineering Co.

**Mendocino County, Cal.,** 381 tons, highway bridges, to Kyle & Co.

### NEW REINFORCING BAR PROJECTS

**Greenport, N. Y.,** 100 tons, grade and high school.

**State of Ohio,** 650 tons, small highway bridges; bids taken Dec. 29.

**San Francisco,** 125 tons, Telegraph Hill Park monument.

**Yountville, Cal.,** 715 tons, Veterans' Home addition.

**Long Beach, Cal.,** 200 tons, public utilities building.

**Riverside, Cal.,** 150 tons, entomology building for University of California.

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# Pipe Lines

**Gulf Pipe Line Co.,** Frick Annex, Pittsburgh, plans construction of 8-in. pipe line from Henryetta, Okla., to Perryman station, near Jenks, Okla., about 45 miles, where connection will be made with main oil pipe line extending to Toledo, Cincinnati and Pittsburgh. Cost about $375,000.

**Skelly Oil Co.,** Skelly Building, Tulsa, Okla., is considering construction of 8-in. pipe line in Eldorado, Kan., oil fields.

**Nashville Gas & Heating Co.,** Sixth Avenue North, Nashville, Tenn., in conjunction with Kentucky Natural Gas Co. and Missouri-Kansas Pipe Line Co., is considering natural gas pipe line from Kentucky State line through Sumner and Davidson counties to point near Nashville, where receiving plant will be located.

**Ajax Pipe Line Co.,** Wilhoit Building, Springfield, Mo., contemplates new 10-in. pipe line from Glenpool, Okla., and vicinity to Wood River, Ill., paralleling a present line between same points and increasing capacity about 30,000 bbl. daily.

### CAST IRON PIPE

Boston opened bids Dec. 28 on 2050 tons of 4 to 16-in. Class B pipe, but no award was made.

Providence, R. I., opened bids Dec. 28 on 800 tons of 4, 8 and 24-in. cement-lined pipe, on which R. D. Wood & Co. was low bidder.

South Milwaukee, Wis., awarded 1000 tons of 24-in. pipe to an unnamed bidder.

Milwaukee is preparing plans and may enter the market for pipe early in the new year.

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# Cast Iron Pipe Freight Rates Upheld

WASHINGTON, Dec. 29.—In a decision announced today, the Interstate Commerce Commission held that rates on cast iron pipe and fittings in carloads from Lansdale and Quakertown, Pa., Bridgeton, Somerville and Florence, N. J., and Chattancoga, Tenn., to distances within 500 miles of these points are not unreasonable. It also held that rates on these products between points in Ohio are not "unduly prejudicial." The commission ordered dismissal of a complaint brought by the Krupp Foundry Co. and other producers.

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# Steel Barrel Output Lower in November

WASHINGTON, Dec. 29.—The November production of steel barrels declined to 453,547 units, representing 32.7 per cent of the 27 establishments reporting to the Bureau of the Census from 489,555 or 35.3 per cent of capacity in October. In the first 11 months of 1931 the output was 5,602,492 barrels, or 36.5 per cent of capacity, compared with 7,023,608, or 46.3 per cent of capacity, in the corresponding period of 1930.

# Grinding of Rolls for Rolling Mills

(*Concluded from page* 1685)

fine grit wheels, through the greater number of cutting points presented to the work, frequently increase production, create less heat, and leave a better surface, thus reducing subsequent operations to a minimum. This is particularly true for redressing rolls to remove fine marks, or to restore surface or shape.

General practice indicates that, for roughing, a traverse of from one-half to two-thirds of the wheel width is best, and for finishing, a maximum of $\frac{1}{4}$ in. for each revolution of the work.

### Wheel Dressing

Dressing for roughing cuts is most ecomonically done with the conventional dresser. For finishing cuts a diamond is necessary. Good, sharp diamonds are essential to a good finish, and great care should be exercised to have these diamonds absolutely tight in their holders. Loose diamonds are one of the causes of chatter marks on the rolls.

It is a mistaken idea that very slow, light dressing or a dull diamond will give a better surface. Such a dressing dulls the wheel face, which gives a burnishing, rather than the cutting action essential to good surfaces. For best results, wheel edges should be stoned for finishing cuts.

### *Wheel Applications and Recommended Gradings*

THESE gradings are general and wheel selections from this list should be made after due consideration of the foregoing factors:

| | Recommended Grading | Harder | Softer |
|---|---|---|---|
| Chilled Iron Rolls and Hot-Mill Rolls; Roughing: | | | |
| Shellac Bond | 30-4-C4A | 30-1-C1A | 30-6-C6A |
| "Redmanol" Bond | 30-12-C12R | 30-9-C9R | 30-14-C14R |
| Vitrified Bond | 241-M-B3 | 201-K-G4 | 36-P-E1½ |
| Chilled Iron Rolls; Finishing: | | | |
| Shellac Bond | 60-6-C6A | 60-4-C4A | 80-6-C6A |
| "Redmanol" Bond | 80-12-C12R | 50-12-C12R | 80-14-C14R |
| Vitrified Bond | 80-P-WE | 80-N-WC | 80-R-WG |
| Chilled Iron Rolls; Regrinding: | | | |
| Vitrified Bond | 80-P-WE | | |
| Steel Rolls; Roughing: | | | |
| Vitrified Bond (1) | 246-O-26 | 401-M-28 | 40-P-25 |
| (2) | 80-P-25 | ..... | 80-12-K12T |
| (3) | 150-P-25 | ..... | ..... |

Steel Rolls: Finishing:

"Redmanol" Bond—220 or finer, depending on individual requirements. For extremely high finishes on well generated surfaces, special recommendations will be made.

Steel Rolls; Regrinding:

Vitrified Bond 150-P-25

For the best results, each of the above wheels should be treated as a roughing and finishing wheel, thus leaving a minimum amount of leveling-off for each succeeding wheel.

One point in grinding hardened steel rolls cannot be over-emphasized—the wheel approach. Wheels should be brought to the work with extreme caution, as the slightest excess wheel pressure will cause a burn that, while shallow, will prove disastrous. Unfortunately, these burns do not show until the roll has had sufficient service to remove the surface gloss, by which time the burned spot has become loosened from the roll in the form of a blister. Frequently these spots are blamed on the roll maker. **Approach the work cautiously.**

### A Few General Observations

When grinding rolls with short-radius camber, either concave or convex, the wheel should be dressed to the same radius. Wheels are self-dressing for long radii.

Caution should be exercised in the use of wobble centers. Carelessness may make these less effective than the roll centers, neglected as they usually are.

From the foregoing, it will be readily appreciated that there are many factors to be considered and many angles of approach in the practical solution of roll-grinding applications. Obviously, there will always be unusual working conditions and questions of grinding practice to be met in the field of roll grinding, such as cannot be satisfactorily treated or answered in an article of this nature. For this reason abrasive manufacturers maintain sales engineering departments to seek the solution of particular problems in this or any other class of grinding.

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# Large Drop Forging Output in Minimum Space

(*Concluded from page* 1673)

On account of the wide variation of forgings manufactured, plenty of space has been provided for inspection, especially on crankshafts, which are centered, hot-straightened, spaced and rough-balanced.

### Eight Boilers Elevated Above the Ground

Construction of the power plant is unique in that there are eight vertical boilers elevated about 10 ft. rather than placed on the ground level. The ash pits, therefore, are at sufficient height above the ground to permit the use of dump carts hauled by a tractor. Boilers are fed by V-type, over-feed stokers which, in turn, are served by an overhead monorail system with clamshell bucket handling incoming coal. One man in the monorail unit attends to all unloading, storing of coal and firing the stokers.

Water for the heat-treating department and the power house is obtained from a large reservoir, which is supplied by 450-ft. wells on the company's property. For heat-treating purposes the same water is used repeatedly. In addition to the water pumped into the reservoir from the wells, all roof water and water from drinking fountains are drained into the reservoir to be used in plant operations.

# United States Buys British Iron; German Steel Prices Cut By Government Decree

(*By Cable*)

LONDON, ENGLAND, Dec. 28.

STEEL mills have generally closed over the holiday period and will not resume operations until early in the new year. British pig iron prospects are considered hopeful with stocks greatly reduced, although the impetus to business given by depreciation of the pound sterling has apparently been exhausted, and exports of Cleveland iron have declined.

A buyer in the United States has placed an order for Lincolnshire basic pig iron with the Normanby Park works of John Lysaght, Ltd.

British steel mills expect improved business in 1932, but are still urging a protective tariff against foreign steel.

Continental mills report larger steel sales to India, but otherwise business is quiet and their order books are poorly filled. The European sellers, however, expect a revival of business if the pound sterling is maintained at a stable level.

Welsh tin plate demand has been affected by the holidays, but mills are generally well engaged, and the outlook for future business is considered optimistic. Negotiations are continuing for renewal of the Welsh tin plate conference and re-establishment of a minimum price.

The International Tube Cartel will meet at The Hague, Holland, some time in January to discuss renewal. The directing committee of the Continental Steel Cartel has been unable to reach an agreement on certain important points and further negotiations for establishing selling syndicates have been postponed to next week.

The French steel syndicates have reaffirmed domestic prices, but the market is not being maintained consistently at this level because of competition among the members.

Under the Government's emergency decree, German domestic pig iron and steel prices have been reduced about 10 per cent, a development which is expected to have an adverse effect on the industry. With a smaller percentage of profit from domestic sales, mills may in many cases be unable to compete for business at the prevailing level of export prices.

German steel mills are understood to be considering abandonment of domestic price fixing and control of output by the quota system. The German Steel Works Association, however, states that there is no intention of abolishing the domestic syndicates, and that present difficulties concern only one organization.

The Borsig A. G. and its subsidiaries have closed, but the suspension is believed to be only temporary. Hanomag A. G. is liquidating.

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## Polish Mill Executing Soviet Contracts Closes

HAMBURG, GERMANY, Dec. 16.—Negotiations between Polish mills and the Soviet Union for revision of steel contracts made prior to abandonment of the gold basis for the pound sterling have been unsuccessful. As a result, the Konigs und Laurahutte, the largest steel works in Poland, has been closed this week although about 70,000 tons of steel products are reported due for shipment on the old contracts. It is stated that the mills expect to resume operation early next spring.

## Germany May Give Steel for Turkish Products

HAMBURG, GERMANY, Dec. 16.—Another barter agreement for exchange of steel for other products is under discussion, this time between Germany and Turkey. It is proposed to exchange 80,000 tons of iron and steel products for Turkish raw materials such as resins, wool, agricultural products and ores. The steel tonnage to be taken on this basis may be increased to 100,000 tons. German steel interests have agreed to cooperate in disposing of the Turkish products received.

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## Japanese Buy Equipment For Pipe Factory

A complete installation of equipment for manufacturing large diameter steel pipe by the "electronic tornado" process of automatic welding in a shielded arc has been ordered by the Asano Dockyard Co., Japan, from the Lincoln Electric Co., Cleveland. This is the second order in the past six months for a pipe factory installation of this kind in Japan and follows the successful operation of the same type of equipment at the Kawasaki Dockyard Co.

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Lukens Steel Co., Coatesville, Pa., has appointed the Dravo-Doyle Co., 300 Penn Avenue, Pittsburgh, sales representative in the Pittsburgh territory for plates, flanged work and other products. McKee-Oliver, Inc., will continue to carry Lukens products in its warehouse at 1326 West Carson Street, Pittsburgh.

### British and Continental European Export Prices f.o.b. United Kingdom and Continental Ports

#### British Prices, f.o.b. United Kingdom Ports

*Per Gross Ton, £ at $3.35*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Ferromanganese, export | £9 | 0s. | | | | $30.15 | | |
| Billets, open-hearth | 5 | 7½ | to | £5 | 12½s. | 18.00 | to | $18.84 |
| Black sheets, Japanese specifications | 9 | 7½ | to | 9 | 10 | 31.40 | to | 31.82 |
| Tin plate, per base box | 0 | 14 | to | 0 | 14¾ | 2.34 | to | 2.46 |
| | | | | | | Cents a Lb. | | |
| Steel bars, open-hearth | 7 | 17½ | to | 8 | 7½ | 1.18 | to | 1.25 |
| Beams, open-hearth | 7 | 7½ | to | 7 | 17½ | 1.10 | to | 1.18 |
| Channels, open-hearth | 7 | 12½ | to | 8 | 2½ | 1.14 | to | 1.22 |
| Angles, open-hearth | 7 | 7½ | to | 7 | 17½ | 1.10 | to | 1.18 |
| Black sheets, No. 24 gage | 8 | 0 | to | 8 | 10 | 1.20 | to | 1.27 |
| Galvanized sheets, No. 24 gage | 9 | 5 | | | | 1.38 | | |

#### Continental Prices, f.o.b. Continental Ports

*Per Metric Ton, Gold £ at $4.86*

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Billets, Thomas | £2 | 8s. | | | | $11.66 | | |
| Wire rods, No. 5 B.W.G. | 5 | 5 | | | | 25.51 | | |
| Black sheets, No. 31 gage, Japanese | 11 | 5 | | | | 54.68 | | |
| | | | | | | Cents a Lb. | | |
| Steel bars, merchant | 2 | 12½ | to | £2 | 14s. | 0.58 | to | 0.59 |
| Beams, Thomas | 2 | 14 | | | | 0.59 | | |
| Angles, Thomas, 4-in. and larger | 2 | 13 | to | 2 | 14 | 0.58 | to | 0.59 |
| Hoops and strip steel over 6-in. base | 3 | 16 | to | 3 | 12½ | 0.79 | to | 0.81 |
| Wire, plain, No. 8 | 5 | 7½ | | | | 1.18 | | |
| Wire, barbed, 4-pt., No. 10, B.W.G. | 8 | 15 | | | | 1.93 | | |

# PLANT EXPANSION AND EQUIPMENT BUYING

## Machine Tool Trade in Year-End Lull

### A Poor December Winds Up One of the Worst Years the Trade Has Ever Experienced

MACHINE tool sales in December, particularly in the latter half, have dropped to a low point even for a year in which most of the tool builders have had the poorest sales in their experience. While there is a willingness to believe that the new year will bring some change for the better, the lack of definite promises of business makes it difficult to forecast the 1932 outlook.

The only new prospect of importance is an inquiry from the General Electric Co. for about 25 machine tools for one of its plants. The Brooklyn Navy Yard has taken bids on four radial drilling machines.

Many machine tool plants were shut down for all or part of the holiday period, but some of them are expected to resume next week.

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#### New York

Machine tool sellers in this district will close 1931 with one of the poorest sales records for any month in one of the worst years they have ever experienced. Although quotations have been sent out during the past two months on a good deal of business, there is very little of it that can be definitely counted on in January. Notwithstanding the lack of signs of an upturn in orders, the trade believes that the new year will bring at least a moderate improvement. The General Electric Co. has issued an inquiry for about 25 tools for one of its plants. The Brooklyn Navy Yard took bids last week on four radial drilling machines.

#### New England

Several New England tool manufacturers took advantage of the holiday season and closed plants until after inventory is finished.

#### Milwaukee

Holiday dullness pervades the machine tool market, but there is hope that the turn of the year will bring improvement in business. Production is at a low ebb, many manufacturers taking advantage of the holiday season to suspend output.

#### Cleveland

The holiday period has tended to further depress the machinery market. Sales tapered off during the week and virtually no new inquiry came out. The trade is basing hope for better business in January on the release of some orders against prospects on which they have been working recently. Metal-working plants in some cases are figuring on work that will necessitate the purchase of machinery should they secure the orders.

#### Chicago

The year-end finds local machine tool dealers somewhat cheered by evidences of greater buyer interest, but with little of a tangible character by which to gage the market early in 1932. Specific inquiries are lacking and there is also a hesitancy to make even tentative promises of action. As a general rule, improvement in sales is not expected for two or three months.

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### ◀ NEW YORK ▶

**Chevrolet Commercial Body Division,** Long Island City, N. Y., manufacturer of automobile bodies, has leased building, 100 x 100 ft., at Foster Avenue and Rockdale Street, for new plant. Capacity will be increased.

**Benjamin Driesler, Jr.,** 153 Remsen Street, Brooklyn, architect, has plans for extensions and improvements in three-story automobile service, repair and garage building. Cost close to $100,000 with equipment.

**Samuel O. Margolis,** New York, manufacturer of metal novelties, leased floor in building at 24-26 Wooster Street for new plant.

**Film Processing Machinery Corpn.,** New York, has been organized by Simon Lowenberg, 510 West 149th Street, and Jerome Herzog, 580 West 161st Street, to manufacture motion picture machinery.

**Grigsby-Grunow Co.,** 5801 Dickens Avenue, Chicago, manufacturer of radio equipment and sets, refrigerators, etc., has acquired controlling interest in Columbia Phonograph Co., Inc., 55 Fifth Avenue, New York, manufacturer of talking machines, parts, records, etc. Plants of Columbia company at Bridgeport, Conn., Oakland and Hollywood, Cal., will be continued in operation.

**Charles Goodman,** 375 Fulton Street, Brooklyn, architect, has plans for automobile service, repair and garage building at Jamaica, L. I.

**Bureau of Supplies and Accounts,** Navy Department, Washington, and Naval Supply Depot, Brooklyn, asks bids until Jan. 5 for power hammer, condensate pumps, hoisting engine, machine tools, coil winding machine, ventilation heaters, electric motors and other equipment for Brooklyn navy yard.

**Mugler's Architectural Iron Corpn.,** Bronx, New York, has been organized by Samuel Terres, 911 East 176th Street, and Albert Mugler, 15 Garden Place, Pelham Manor, N. Y., to operate plant at 830 Williamsbridge Road, in conjunction with Mugler iron works and affiliated iron and steel interests.

**Kings County Lighting Co.,** 6740 Fourth Avenue, Brooklyn, will soon take bids on general contract for equipment storage and distributing plant. E. L. Phillips & Co., 50 Church Street, New York, consulting engineers. Cost over $60,000 with equipment.

**W. G. B. Oil Clarifier, Inc.,** Kingston, N. Y., has been organized by W. Gordon Burhans, 130 Smith Avenue, Kingston, and James E. Hurn, R.F.D., Saugerties, N. Y., capital $100,000, to manufacture oil clarifiers, tools and mechanical appliances.

**New York & Richmond Gas Co.,** 591 Bay Street, St. George, S. I., has plans for artificial gas plant at Honeywood, S. I. Cost over $100,000 with equipment.

**Department of Hospitals,** Municipal Building, New York, will soon takes bids for new buildings at farm colony, Sea View Hospital, Richmond, S. I., including extensions in repair shop and automobile service and garage building. Sibley & Fetherston, 205 East Forty-second Street, New York, architects.

**Carrier Corpn.,** 850 Frelinghuysen Avenue, Newark, N. J., manufacturer of air-conditioning equipment, ice-making machinery, etc., will remove plant of subsidiary, Brunswick-Kroeschell Co., Chicago, manufacturer of ice machinery, air-cooling equipment, etc., to main works at Newark where new department will be established. Manufacturing branch at New Brunswick, N. J., will be continued.

**Smith Tractor & Equipment Co.,** Irvington, N. J., care of Collins & Corbin, 1 Exchange Place, Jersey City, N. J., attorneys, has been organized by Fred C. Smith, Flushing, L. I., and Edwin H. Smith, St. Albans, L. I., to manufacture motor tractors and equipment.

**Davis Laboratories, Inc.,** Hillside, Newark, N. J., care of Robert W. Wolfe, 24 Branford Place, Newark, attorney, recently organized by David Davis and associates, capital $100,-

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# MADE OF BYERS

# *WROUGHT IRON*

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**These black or galvanized Genuine Wrought Iron Sheets are made of the same quality genuine wrought iron as Byers Pipe.**

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**AN INVESTMENT** BYERS 1864 GENUINE WROUGHT IRON **NOT AN OUTLAY**

000, leased one-story factory at 1465 Long Avenue, Hillside, for manufacture of paints, enamels, etc.

**Bureau of Yards and Docks,** Navy Department, Washington, asks bids (no closing date stated) for one-story building at naval air station, Lakehurst, N. J. (Specification 6455).

**International Paper Co.,** 220 East Forty-second Street, New York, plans power and industrial development at mill properties, Corinth, N. Y., including hydroelectric power station and artificial lake nine miles long. Cost over $2,000,000 with equipment.

**Belleville Iron Works,** 55 Valley Street, Belleville, N. J., recently organized by S. T. Carlson, formerly of **T. P. Carlson Co.,** Roselle Park, N. J., has taken over plant of Lee Boiler Works, Belleville, for manufacture of tanks, boilers, stacks, etc.

## BUFFALO

**Syracuse Lighting Co., Syracuse, N. Y.,** subsidiary of Niagara Hudson Power Corpn., Buffalo, will expend about $1,000,000 in remodeling artificial gas plants and system for use of mixture of artificial and natural gas, including installation of equipment at present coal-gas station on Hiawatha Street, to be used as main operating unit; pipe lines, booster stations, etc. Natural gas will be secured from Lycoming Natural Gas Co., Wayne, N. Y., now building pipe line to Syracuse city limits.

**Vacuum Oil Co.,** Olean, N. Y., plans rebuilding part of refinery destroyed by fire Dec. 22. Loss over $70,000 with equipment. Headquarters of company at 61 Broadway, New York.

**United States Engineer Office,** Buffalo, asks bids until Jan. 5 for one 6-cu. yd. dipper dredge, one extra mud lip, and four extra reversible point teeth (Circular 89).

**Metal Spinning Co., Inc.,** Buffalo, has been organized by John Allen, 32 Victoria Boulevard, Kenmore, and associates, to manufacture metal goods.

**Steamburg Dairy Products Corpn.,** Salamanca, N. Y., plans rebuilding part of plant recently destroyed by fire. Loss close to $100,000 including equipment.

**Lake Ontario Power Corpn.,** Sodus, N. Y., contemplates an electric power station and extensions in power lines. Cost over $90,000 with equipment.

**Binghamton Gas Co.,** Chenango Street, Binghampton, N. Y., now operating natural and artificial mixed gas system, has applied for permission to operate natural gas service exclusively. Will make plant extensions and improvements for change, securing natural gas from Altay-Tyrone field, N. Y.

## PHILADELPHIA

**Philadelphia Electric Co.,** Tenth and Chestnut Streets, Philadelphia, is carrying out expansion and improvements at artificial gas plant at Chester, Pa., including installation of gas-generating, compressor, mechanical-handling and other equipment. Cost about $450,000.

**American Ice Co.,** 121 North Broad Street, Philadelphia, let general contract for new plant to Sutton & Stephenson, 1317 Washington Avenue. Cost over $40,000 with equipment.

**Bell Telephone Co. of Pennsylvania,** 1312 Arch Street, Philadelphia, has authorized fund of $25,500,000 for expansion and improvements, including new stations, equipment, lines, etc. About $8,500,000 of appropriation will be expended in Philadelphia district.

**Perseverance Iron Foundry,** Latona Street and Passyunk Avenue, Philadelphia, plans rebuilding part of plant recently destroyed by fire.

**Supply Officer,** Naval Aircraft Factory, Navy Yard, Philadelphia, asks bids until Jan. 4 for quantity of reversible ratchet handles, automobile wrenches, double end adjustable wrenches (Req. 7503); for quantity of piston rings (Req. 10151); fuel line strainers, valves, valve stems, etc. (Req. 8481).

**Quaker City Chemical Co.,** 2736 North Broad Street, Philadelphia, will remove certain equipment from local plant for installation in new branch plant at Knoxville, Tenn. Will install complete unit for sulphonation of vegetable oils, etc., including lead-lined tanks, pumping machinery, acid tanks and auxiliary equipment. Company is affiliated with O. F. Zurn Co., first address noted, manufacturer of industrial oils, chemicals, etc.

**Blue Flash Corpn.,** Wellsville, York County, Pa., has been organized by E. Bruce Taylor, 1600 Briggs Street, Harrisburg, Pa., Paul D. Bodwell, Wellsville, and associates, to manufacture electrical and mechanical devices and equipment.

**Philadelphia Drying Machinery Co.,** 3351 Stokley Street, Philadelphia, has perfected new type of air-conditioning equipment to restore normal moisture content to different products and will develop for commercial output, including parts and assembling.

**Newcastle County Board of Trustees,** Newcastle, Del., will soon take bids for shop and work house at Greenbank prison. Clarence R. Hope, duPont Building, Wilmington, Del., architect.

**Board of Education,** Wilmington, Del., authorized installation of manual training department in new elementary school at Thirty-sixth and Jefferson Streets. Cost about $435,000. E. William Martin, duPont Building, architect.

**Autocar Co.,** Ardmore, Pa., manufacturer of motor trucks, is now running on four-day week schedule. Order has been received from Sanitary Commission, New York, for 162 heavy-duty truck chassis, equipped with bodies for street-flushing, totaling $486,000.

**Kint-er-Matic Advertising Corpn.,** York, Pa., has been organized by Lewis M. Kinter, Wellsville, Pa.; Lloyd L. Kinter, Dillsburg, Pa.; and Calvin E. Cook, Dillsburg, to manufacture machines and mechanical devices for advertising service.

**Pottstown Borough School District,** Pottstown, Pa., will soon ask bids on revised plans for three-story junior and senior high school, and will install manual training department. Cost about $325,000. Hasness & Albright, Harrisburg, Pa., architects.

**Fanning-Schuett Engineering Co.,** Philadelphia, has been awarded contract for concrete and steel coal trestle and changes to coal-handling machinery for James F. Nolen & Sons, Penn Street and Belfield Avenue, Philadelphia.

## NEW ENGLAND

**Building Department,** City Hall, Cambridge, Mass., asks bids on general contract until Jan. 5 for multi-story addition to Rindge Technical High School, for Board of Education, M. E. Fitzgerald, superintendent. Cost $1,500,000 with equipment. Ralph Harrington Doane, 60 Batterymarch Street, Boston, architect.

**Pratt & Whitney Aircraft Co.,** Hartford, Conn., manufacturer of airplane engines, is arranging establishment of gear-manufacturing department at East Hartford, and will remove aircraft gear division from plant of Pratt & Whitney Co. to that point, using about 12,000 sq. ft. floor space for expansion.

**Connecticut Light & Power Co.,** Hartford, Conn., has authorized fund of $3,400,000 for extensions and improvements in power plants, transmission lines and system.

**Hub Auto Radiator Co., Inc.,** Boston, has been organized by Louis Levine, Carl Fritz and associates, capital $50,000, to take over and expand company of same name with works at 205 Brighton Avenue.

**Kron Co.,** 430 East Fifty-third Street, New York, formerly American Kron Scale Co., manufacturer of scales, balances, etc., has leased 20,000 sq. ft. floor space in building at Bridgeport, Conn., for new plant.

**Mexican Petroleum Corpn.,** 122 East Forty-second Street, New York, plans oil storage and distributing terminal at Salem, Mass. Cost over $75,000 with equipment.

**Northern Gas Utilities Co.,** 15 Congress Street, Boston, plans artificial gas plant at Provincetown, Mass. Cost about $80,000 with equipment. George H. Stevens, 141 Milk Street, Boston, engineer.

**Independent Lock Co.,** Fitchburg, Mass., manufacturer of locks, hardware products, etc., has purchased plant and business of Lockwood Mfg. Co., Norwalk, Conn., manufacturer of builders' hardware. Operations of Lockwood plant will be continued and working force increased.

**Board of Trustees,** Mount Holyoke College, South Hadley, Mass., has plans for two-story and basement addition to steam power plant, 50 x 100 ft. Cost over $100,000 with equipment. French & Hubbard, 210 South Street, Boston, consulting engineers.

**Ames, Baldwin, Wyoming Shovel Co.'s** general executive offices are now centered at Baldwin plant, Parkersburg, W. Va. Plant operations and division sales offices will not be affected by change.

**City of Providence,** R. I., has closed bids on an incinerator to cost $500,000 with equipment.

## SOUTH ATLANTIC

**Consolidated Gas, Electric Light & Power Co.,** Lexington Building, Baltimore, will build storage and distributing holder for artificial gas service near Cold Spring Lane, Jones Falls Valley, capacity 7,000,000 cu. ft. Cost about $500,000 with equipment, pipe lines, etc.

**Board of District Commissioners,** Washington, asks bids until Jan. 6 for one-story addition to municipal repair shop, appropriation of $25,000 available; until Jan. 14 for two lathes, three planers, four saw benches, four sanders and four work benches for public schools. Plans at room 427, District Building.

**H. L. Whitesell,** Lowmoor, Va., and P. A. McDaniel, Clifton Forge, Va., have organized Monroe Manganese Mining Co. to operate manganese mines.

**Richmond Fixture & Equipment Co.,** Governor Street, Richmond, Va., plans rebuilding part of storage and distributing plant recently destroyed by fire. Loss about $25,000 with equipment.

**Purchasing Agent,** Post Office Department, Washington, asks bids until Jan. 4 for one portable floor crane, 6000-lb. capacity; one motor-driven bench grinder, and three steel cabinets.

**McClaren Rubber Co. of North Carolina, Inc.,** has been organized by I. E. Isbrouch and P. J. Mayle, Charlotte, N. C., to take over and expand company of same name, with local mill for manufacture of automobile tires and other rubber products.

**Chief of Engineers, Washington,** will ask bids soon for two steam-driven, stern-wheel river dredges, 265 ft. long overall, 47 ft. 10 in. wide, with steam propulsion, turbine-driven generating set, 20-in. electric-operated dredging pump, electric and steam auxiliaries, boilers, etc.

**Flashlight Corpn. of Virginia, Inc.,** Fieldale, Va., recently organized by C. B. Collins and associates to manufacture batteryless flashlights, etc., has begun erection of one-story plant, 50 x 200 ft. Cost about $50,000 with equipment. Eubank & Caldwell, Inc., Boxley Building, Roanoke, Va., architect. Will build housing development for employees.

**Board of Glynn County Commissioners,** Brunswick, Ga., contemplates construction of hangar with repair facilities at airport, Redfern Field, St. Simons Island.

**Bureau of Supplies and Accounts,** Navy Department, Washington, asks bids until Jan. 12 for following equipment for navy yard at Hampton Roads, Va.: Two motor-driven drill pointer machines (Schedule 7180), one motor-driven brake shoe grinding machine (Schedule 7192), one motor-driven universal testing machine (Schedule 7173), hand-operated floor type veneer presses (Schedule 7177), one motor-driven die-making machine (Schedule 7176), two motor-driven combination grinder and buffer machines (Schedule 7179), six motor-driven drilling machines (Schedule 7181), and three silencers for power plant (Schedule 7192); for San Francisco or New York yards, two motor-driven engine lathes (Schedule 7158); 4000 cable-eye turnbuckles for Philadelphia yard (Schedule 7190); quantity of ratchet braces, breast drills and hollow handles for Eastern and Western yards (Schedule 7140); 64 welding oxy-acetylene torches for Hampton Roads, Puget Sound and other yards (Schedule 7143).

## CINCINNATI

**Kroger Grocery & Baking Co.,** 35 East Seventh Street, Cincinnati, has asked bids on general contract for one-story branch storage and distributing plant, 60 x 200 ft., with extension, 45 x 70 ft., at Columbus, Ohio. Cost over $85,000 with equipment. Architectural and engineering department, Cincinnati, in charge.

**Board of Education,** 511 Court Street, Cincinnati, plans manual training department in new two-story and basement school on California Avenue. Cost $350,000. General contract recently let to Penker Construction Co., 1030 Summer Street. C. F. Cellarius, St. Paul Building, architect.

**Contracting Officer,** Wright Field, Dayton, Ohio, asks bids until Jan. 6 for two motor-driven precision drill presses (Circular 246); one transformer (Circular 247).

**Dayton Refrigeration Corpn.,** Dayton, manufacturer of electric-operated refrigerators, parts, etc., is arranging to increase production to 2000 units a month during next 90 days, compared with present output of 400 refrigerating units monthly. Company recently secured order totaling $750,000.

**Constructing Quartermaster,** Patterson Field, Ohio, asks bids (no closing date stated) for

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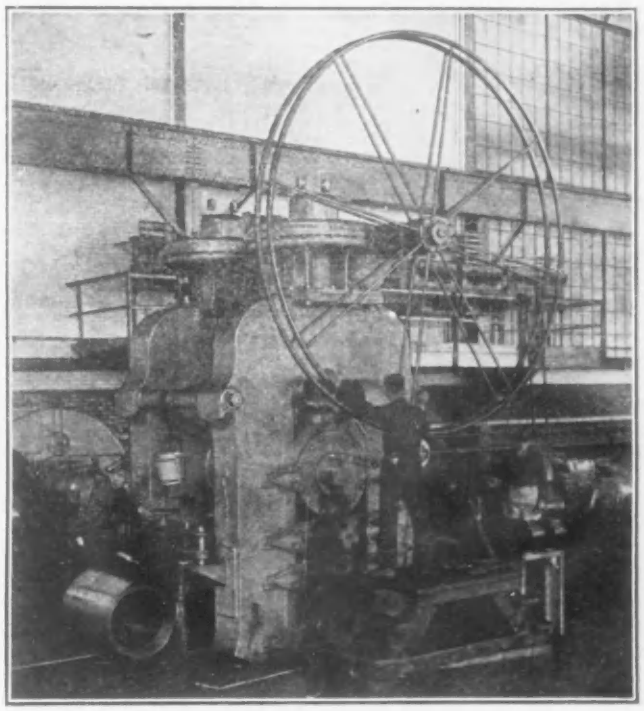

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# BLISS

one-story air corps hangar, with annex for shop and reconditioning service, and for oil reclamation unit.

**Tennessee Electric Power Co.**, Chattanooga, Tenn., plans expenditure of $850,000 for line equipment, overhead conductors, etc., for transmission lines; about $200,000 for switching station equipment, including oil circuit breakers, regulating apparatus, etc.; about $175,000 for transformers and kindred installations.

**City Council**, Easton, Ohio, has asked bids for municipal electric light and power plant. Appropriation of $233,000 recently voted. M. L. Reid, city engineer. George Champe & Associates, Nicholas Building, Toledo, Ohio, consulting engineers.

**City Council**, Versailles, Ky., contemplates installation of automatic electric-operated pumping equipment in connection with extensions in municipal waterworks, bids to be asked in February. Howard K. Bell, Lexington, Ky., consulting engineer.

**E. E. Folmer**, official of Borger Brothers Boiler Works, 257 West Spring Street, Columbus, Ohio, has asked bids on general contract for one-story automobile service, repair and garage building, 70 x 160 ft. Bassett & Tresselt, 257 East Broad Street, architects.

## CLEVELAND

**City Commission**, Lima, Ohio, asks bids until Jan. 11 for municipal electric light and power plant. Fred C. Becker, City Hall, city manager. LeRoy E. Miller, city engineer.

**J. Leonard Rusk**, 241 Sixteenth Street, Toledo, Ohio, architect, has plans for one-story industrial plant, 35 x 250 ft. Cost about $35,000 with equipment. Owner's name temporarily withheld.

**Scranton Truck Body & Equipment Co.**, Cleveland, care of E. J. Lobday, 582 Arcade Building, has been organized by Mr. Hobday, Robert and John Hilliard, to manufacture motor truck bodies and equipment.

**Farrell-Cheek Foundry Co.**, Sandusky, Ohio, is on normal production schedule, giving employment to regular force of 150 men. Majority of output is devoted to automobile parts.

**Goodyear Tire & Rubber Co.**, Akron, Ohio, has plans for two-story factory branch, storage and distributing plant at Cleveland. Cost $100,000 with equipment. W. D. LaDue, manager, architectural, engineering and service division, Akron, in charge.

**Swift & Co.**, Union Stock Yards, Chicago, have purchased property at Youngstown, Ohio, for new storage and distributing plant, with refrigerating department, etc. Cost over $50,000 with equipment.

## ST. LOUIS

**Beebe Transfer Co.**, 644 Brooklyn Avenue, Kansas City, Mo., has applied for permission to build one-story motor truck repair shop.

**Cherokee Milling Co.**, Cherokee, Okla., plans rebuilding part of flour milling plant recently destroyed by fire. Loss about $200,000 with equipment.

**Oklahoma Gas & Electric Co.**, Oklahoma City, Okla., plans new high voltage power substation at Guthrie, Okla. Cost about $70,000 with machinery. Byllesby Engineering Co., 321 South La Salle Street, Chicago, engineer.

**City Council**, Oklahoma City, Okla., plans installation of electric-operated pumping machinery in connection with extensions and improvements in municipal sewage system. Bond issue of $750,000 is being arranged. City engineer in charge.

**Nebraska Consolidated Mills, Inc.**, Omaha, Neb., plans rebuilding part of grain milling plant recently destroyed by fire. Loss about $200,000 with machinery.

**Common Council**, St. Clair, Mo., plans purchase of electric-operated pumping machinery and auxiliary equipment in connection with municipal waterworks extensions and improvements. W. A. Fuller Co., 2619 Shenandoah Avenue, St. Louis, consulting engineer.

**Standard Machine & Mfg. Co.**, Carthage, Mo., plans rebuilding part of plant recently destroyed by fire. Loss about $30,000 with equipment.

**Stanolind Pipe Line Co.**, Philcade Building, Tulsa, Okla., has approved plans for one-story addition to pumping plant, 66 x 78 ft., at Drumright, Okla. Cost about $40,000 with machinery.

**Forrest City Cotton Oil Co.**, Forrest City, Ark., affiliated with East St. Louis Cotton Oil Co., East St. Louis, Ill., is planning to rebuild part of mill recently destroyed by fire. Cost about $30,000 with machinery.

**Sinclair Consolidated Oil Corpn.**, 45 Nassau Street, New York, is arranging merger with Prairie Oil & Gas Co., Independence, Kan., and subsidiary, Prairie Pipe Line Co. Consolidated organization will carry out expansion and development program, including bulk oil storage and distributing units, pipe lines, etc.

## INDIANA

**Jacmar Metals Co.**, Indianapolis, recently organized by Jack M. Marx and Leon M. Hillman, Indianapolis, has leased property at 624 West Washington Street for new metal works. First noted is president.

**Chesapeake & Ohio Railroad Co.**, Richmond, Va., let general contract to K. E. Reed & Co., Charleston, W. Va., for one-story engine house, 30 x 100 ft., with locomotive repair facilities, at Peru, Ind. Cost about $35,000 with equipment. C. W. Johns, Richmond, company engineer.

**Sunbeam Electric Mfg. Co.**, Evansville, manufacturer of isolated farm lighting plants, electric headlights, etc., has been reorganized under same name with capital of $650,000.

**Johnston Case Goods Co.**, Union City, manufacturer of furniture, occupying former factory of Union City Carriage Co., plans rebuilding part of works recently destroyed by fire. Loss over $50,000 including equipment.

**Studebaker Corpn.**, South Bend, has increased working force 100 per cent since November, and is now running on nine-hour day at local automobile plant, employing about 9000 persons.

**W. & W. Tractor & Implement Co., Inc.**, Richmond, organized by Perry Weist and W. B. Williams, Richmond, to manufacture farm tractors, agricultural implements, etc.

**Ladoga Canning Co.**, Lebanon, plans one story addition for storage and distribution, with mechanical loading equipment for motor trucks. Cost over $25,000.

## MILWAUKEE

**Scanlon-Morris Co.**, Madison Wis., manufacturer of hospital and laboratory equipment, has acquired business of Operay Laboratories, Chicago, and will transfer plant to main works at Madison on Jan. 1. Chicago company makes special illuminating fixtures for hospital operating rooms.

**Kissel Co.**, Hartford, Wis., has been incorporated as successor to defunct Kissel Motor Car Co., to be operated by bondholders' committee and continue business as sponsor of several new companies utilizing space in present plant.

**Two Rivers Metalware Corpn.** has been incorporated to take over and continue business of Metalware Corpn., 1710 Monroe Street, Two Rivers, Wis., manufacturer of mechanical and electrical toys, copper cooking utensils, etc. Capitalization of new corporation is $250,000. Principals are Elmer Drumm, Charles O. Drumm and Elmer Bleser.

**David W. Bloodgood**, attorney, 212 West Wisconsin Avenue, Milwaukee, representing Milwaukee syndicate, has received contract to build concrete highway across Isthmus of Panama at cost of $5,000,000. Road will be 60 miles long and parallel Panama Canal and railway. Work will require purchase of power shovels, motor trucks, tractors, concrete mixers, excavators and other equipment costing about $125,000.

**Fairbanks, Morse & Co.**, Chicago, have recalled 1000 employees of main works at Beloit, Wis., on part time schedules. Complete shutdown of Beloit works, announced recently, lasted only a few days.

**Allis-Chalmers Mfg. Co.**, Milwaukee, has booked new orders for $750,000 worth of equipment for 14 shifting locomotives of Pennsylvania Railroad for service on New York-Washington electrification project. Milwaukee company recently received orders valued at $1,000,000 from same railroad.

**Badger Wire & Iron Works**, Milwaukee, has bought assets of Wisconsin Art Bronze & Iron Co., same city. Personnel of Wisconsin company has become associated with purchasing company.

## GULF STATES

**Arkansas Fuel Oil Co.**, Willow Springs, Tex., plans new gasoline refinery, with daily capacity of 80,000 gal. Cost over $100,000 with equipment, storage and distributing facilities, and pipe line connections.

**Quartermaster Supply Office**, Fort Sam Houston, Tex., asks bids until Jan. 11 for quantity of galvanized pipe fittings, pipe unions, 89,000 ft. wrought iron pipe, 25 tanks or boilers, brass pipe fittings, cast iron soil pipe fittings, valves, etc. (Circular 130).

**Adams Paint Co.**, West Eightieth and Franklin Streets, Cleveland, plans factory branch, storage and distributing plant at Dallas, Tex. K. D. Hancock, manager at Dallas.

**City Commission**, Jacksonville, Fla., has acquired 30-acre tract adjoining municipal airport and plans expansion and improvements, including hangar with repair and reconditioning facilities, and other field units. Bids soon asked on general contract by city engineer.

**National Gas & Oil Corpn.**, Carthage, Tex., recently organized with capital of $5,000,000, has acquired oil properties in Panola County field for oil and natural gas development. It is planned to install drilling and power equipment and build pipe lines.

**Board of Education**, Galveston, Tex., plans manual training department in new multi-story junior high school. General contract recently let to M. D. Bowden, 1801 C Street, and superstructure is under way. Cost about $300,000. Giesecke & Harris, Norwood Building, Austin, Tex., architects; L. D. Royer, Smith-Young Tower, San Antonio, Tex., mechanical engineer.

**Central Texas Hydro-Electric Co.**, Seguin, Tex., recently organized, has taken over Hamilton power dam and other dam sites of Emery, Peck & Rockwood Development Co., Chicago, in Burnet, Llano, Travis and San Saba counties. New organization will carry out hydroelectric power development begun by last noted company. Cost over $2,500,000 with transmission lines and distributing system.

**Humble Oil & Refining Co.**, Houston, Tex., contemplates gasoline oil refinery near Arp, Smith County, Tex. Cost over $90,000 with equipment.

**Atchison, Topeka & Santa Fe Railway Co.**, Amarillo, Tex., has work under way on one-story mechanical shop at Albuquerque, N. M.

**Air Corps, United States Army**, Barksdale Field, near Shreveport, La., will expend over $1,000,000 for new buildings and work at local airport during next six months. Field is being developed as largest airport in world, with ultimate cost of $8,000,000. Over $3,500,000 has been appropriated for initial work, about $1,300,000 being still available.

**H. C. Badger and Alexander Davidson**, Amarillo, Tex., have superstructure under way for one-story ice-manufacturing plant. Cost about $50,000 with machinery. Harry M. Warren, 1012 Pierce Street, architect.

## DETROIT

**Long Mfg. Co.**, 2768 East Grand Boulevard, Detroit, manufacturer of automobile radiators, clutches, etc., let general contract to Alfred A. Smith, Penobscot Building, for one-story addition for an enameling unit. Cost about $30,000 with equipment.

**Great Lakes Fruit Industries, Inc.**, Benton Harbor, Mich., contemplates erection of four new canning plants in western part of State, with storage and distributing units, each to cost $25,000 with equipment.

**Board of Works**, Marquette, Mich., plans installation of electric-operated pumping machinery in connection with extensions and improvements in municipal waterworks. Cost about $40,000. Pearse, Greeley & Hansen, 6 North Michigan Avenue, Chicago, consulting engineers. Bids asked in about 30 days.

**Board of Trustees**, Wayne County Training School, Northville, Mich., asks bids for two-story vocational training school, 115 x 410 ft. Cost over $100,000 with equipment. Nathaniel O. Gould, Empire Building, Detroit, is architect and engineer.

**Wilcox Laboratories**, Charlotte, Mich., manufacturers of radio receivers and kindred equipment, an interest of Sterling Mfg. Co., 2831 Prospect Avenue, Cleveland, has been purchased by Chester M. Wilcox and Paul Gay, owners of plant prior to 1929. Company will be reorganized and expansion carried out.

**Stinson Aircraft Corpn.**, Wayne, Mich., a division of Cord Corpn., Auburn, Ind., is carrying out expansion and improvements, including installation of new tools, precision equipment, etc. Company is placing material orders for aircraft to total over $2,000,000 and will soon begin capacity production with full working quota.

**Motor Wheel Corpn.**, East Lansing Street, Saginaw, Mich., is increasing production and

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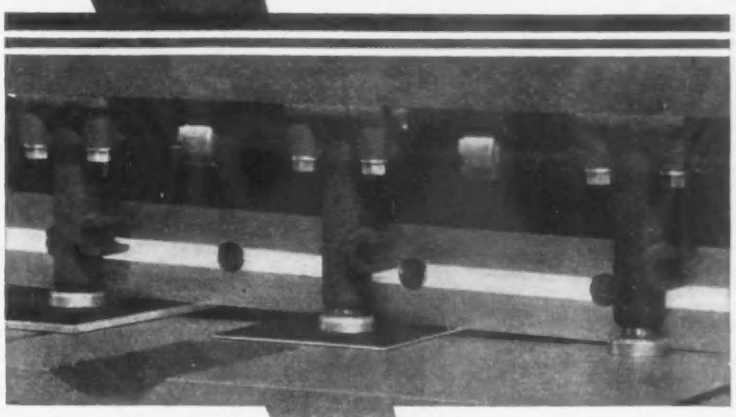

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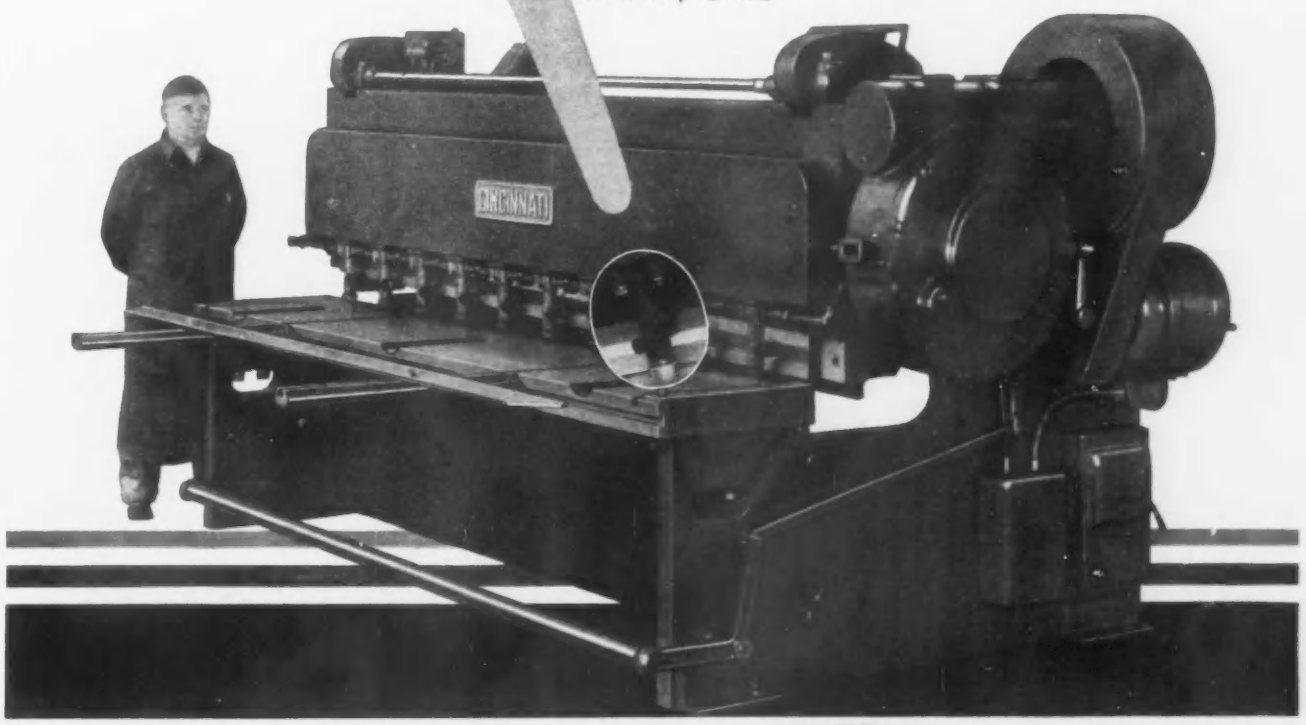

adding about 300 men to working force. Several departments of pressed steel division will be run on 24-hr. schedule for first time in several months.

**Titus Russell,** Albion, Mich., is completing new plant for manufacture of new type of heating furnace, including parts and assembling departments.

**Burroughs Adding Machine Co.,** 6071 Second Avenue, Detroit, has designed new standard typewriter and will develop department for production, operating on capacity basis.

## CHICAGO

**Wizard, Inc.,** 1141 West Thirty-seventh Street, Chicago, manufacturer of household appliances and equipment, has purchased one-story factory of Continental Can Co. in Clearing Industrial District, totaling 64,000 sq. ft. floor space, on site 136,841 sq. ft. for additional units. Present works will be removed to new location and capacity doubled. Cost over $100,000.

**Pullman Car & Mfg. Corpn.,** Chicago, has been organized with capital of $1,000,000 to take over and expand company of same name at 110th Street and Cottage Grove Avenue, manufacturer of railroad cars, trucks, etc. New company is subsidiary of Pullman Co., 79 East Adams Street.

**Heinrich Chemical Co.,** Minneapolis, manufacturer of industrial chemicals, plans rebuilding part of plant recently destroyed by fire. Loss about $50,000 with equipment.

**Board of Trustees,** Carlton County, Carlton, Minn., Oscar W. Samuelson, County auditor, asks bids until Jan. 5 for one automatic mechanical stoker for court house power plant.

**United States Engineer Office,** St. Paul, Minn., asks bids until Jan. 5 for power house at Twin City locks, Minneapolis (Circular 911).

**Dawn Mfg. Co.,** 2811 North Ashland Avenue, Chicago, has been organized by R. H. Decker and F. E. Anderson to manufacture food mixers, choppers, etc.

**Denver & Rio Grande Western Railroad Co.,** Denver, is considering rebuilding ice plant at Grand Junction, Colo., recently destroyed by fire. Loss about $65,000.

**Redlands Irrigation District,** Grand Junction, Colo., has authorized erection of hydro-electric generating plant near city. Cost about $100,000 with equipment.

**State Board of Administration,** Bismarck, N. D., plans call for bids early in January for power plant at State school for feebleminded, Grafton, N. D. Pillsbury Engineering Co., 1200 Second Avenue South, Minneapolis, engineer.

**David Bradley Mfg. Co.,** Kankakee, Ill., manufacturer of agricultural implements, is increasing production and adding to working force.

**Whiting Corpn.,** Harvey, Ill., has received contract for 40 two-wheel trucks for cable towers for use in construction of Madden Dam, Panama Canal Zone.

## PITTSBURGH

**Westinghouse Electric & Mfg. Co.,** East Pittsburgh, let general contract to J. W. Cowper Co., Rand Building, Buffalo, for one and two-story factory branch, storage and distributing plant, with shop unit, 112 x 360 ft., at Buffalo. Cost over $100,000 with equipment.

**West Leechburg Steel Co.,** West Leechburg, Pa., plans rebuilding part of plant destroyed by fire Dec. 24. Loss over $40,000 with equipment.

**McConway & Torley Corpn., Pittsburgh,** has been organized by William J. Lappe and Joseph L. Kerr, Pittsburgh, to take over and expand McConway & Torley Co., Forty-eighth Street and Allegheny Valley Railroad, manufacturer of iron and steel products.

**Board of Trustees,** Shaler Township, Ross Township, West View Township and Millvale Borough, care of McCully Engineering Co., Berger Building, and F. G. Ross, 309 Fourth Avenue, engineer, both Pittsburgh, plan installation of pumping machinery and other equipment in connection with new joint trunk sewer line. Cost about $200,000. Bids soon asked on general contract.

**Board of Education,** Oil City, Pa., E. W. Egan, secretary, plans manual training department in new multi-story senior high school. Cost over $200,000. Brenot & Brown, Traymore Building, architects.

**New Products Co.,** Pittsburgh, has been organized by H. M. Kidner, 5536 Hampton Street, Pittsburgh, and W. L. Waltz, Fairmont City, Pa., to manufacture mechanical appliances and devices, commercial fixtures, etc.

**Board of Education,** Bellevue, Pa., plans manual training department in new multi-story senior and junior high school, bids to be asked on general contract in about 90 days. Cost about $250,000. Edward Stotz, Bessemer Building, Pittsburgh, architect.

**C. V. Hill & Co., Inc.,** 360 Pennington Avenue, Trenton, N. J., manufacturer of refrigerators, has leased one-story building at 5534 Baum Boulevard, Pittsburgh, for factory branch, storage and distributing plant, with service department.

## PACIFIC COAST

**Bureau of Water and Power,** City Hall, Los Angeles, plans steam-operated electric generating plant at Wilmington harbor, capacity 60,000 kw. Cost about $7,000,000 with transmission lines.

**Board of Education,** Los Angeles, has low bid on general contract from George Mittry, 816 West Fifth Street, for two-story addition, 70 x 140 ft., to manual training shop at John C. Fremont High School. Cost over $85,000 with equipment.

**Los Angeles Gas & Electric Corpn.,** South Flower Street, Los Angeles, will complete plans in about 90 days for addition to steam-operated electric power plant at Seal Beach, including installation of new turbo-generator and auxiliary equipment. Cost over $3,000,000.

**Coca-Cola Co.,** 3216 Sacramento Boulevard, Sacramento, Cal., plans two-story bottling plant on Miller Way, 75 x 125 ft. Cost over $50,000 with automatic bottling, conveying and other equipment.

**Charles Mayse,** Tucson, Ariz., has leased one-story hangar, 35 x 150 ft., to be built by City Council at municipal airport, and will install repair and reconditioning shop, oil storage and distributing facilities, etc.

**Quartermaster Supply Officer,** Fort Mason, San Francisco, asks bids until Jan. 14 for quantity of conduit, metal molded fittings, cartridge fuses, fuse links, 18 watthour meters, bushings, 60,810 ft. rubber-covered copper wire, 25,200 ft. weatherproof copper wire and other equipment. (Circular 136).

**Automatic Controls, Inc.,** Seattle, has been organized by Edward M. Hay, Colman Building, and Merrill N. Musgrave to manufacture automatic control devices and equipment for oil burner, refrigerator and other service.

**Board of Public Works,** Long Beach, Cal., has revised plans for three-story equipment storage and utility building, 60 x 120 ft., with garage and service department. Cost about $115,000 with equipment. Dedrick & Bobbe, Heartwell Building, architects.

**Washington Gas & Electric Co.,** Everett, Wash., plans gas system and transmission lines to cost about $75,000, including station expansion.

**Welded Products Co., Inc.,** Oakland, Cal., care of Gilman & Harden, Henshaw Building, attorneys, has been organized by Fred P. Glick, Alameda, Cal., and William H. Ringe, Berkeley, Cal., with capital of $200,000, to manufacture iron and steel products.

**Bureau of Yards and Docks,** Navy Department, Washington, asks bids (no closing date stated) for new units at naval aircraft station, Sunnyvale, Cal., including helium storage building with capacity of 1,000,000 cu. ft., helium repurification building, and administration building. Bids will be asked soon for gasoline storage tanks at San Diego yard.

**Board of Education,** Sacramento City School District Sacramento, plans manual training shop at new junior high school at East Sacramento. Cost about $325,000. Charles Dean, California State Life Building, architect.

## CANADA

**Little River Brick Co.,** Little River, N. B., will start work next spring on a plant addition to cost $20,000.

**National Fertilizers, Ltd.,** Port Burwell, Ont., has plans for erection of a manufacturing plant.

**Baker, Perkins, Inc.,** Saginaw, Mich., will start work in spring on erection of a plant at Sarnia, Ont., for manufacture of baking and confectionery machinery, etc. Cost about

**Lever Brothers, Ltd.,** Eastern Avenue, Toronto, is receiving bids for plant addition. Darling & Pearson, 2 Leader Lane, are architects.

**Niagara Brand Spray Co.,** Freeman Street, Burlington, Ont., has awarded contract to Slater & Copp, Waterdown, Ont., for plant to cost $50,000.

**A. Plamondon,** consulting engineer, 30 St. James Street West, Montreal, has recommended purchase by Cap de la Madeleine, Que., of one 100 gal. per min. centrifugal pump direct connected to 100-hp. motor, 220 volts; two 700 gal. per min. centrifugal pumps with 50-hp. motor, three 225 hp. Sterling gasoline engines. R. Rocheleau is clerk.

## FOREIGN

**Ministry of Finance,** Government of Yugoslavia, Belgrade, plans erection and operation of automobile manufacturing plant and will grant concession to a foreign company in that line (competitive offers being solicited) for project. Plant is to be built within six months of signing contract and will be equipped for production of passenger cars, motor trucks, busses and tractors, including parts manufacture and assembling. Minimum capacity 1000 automotive units daily.

**Swiss Federal Railways,** Zurich, Switzerland, is arranging construction and improvement fund for 1932, about 86,256,800 fr. (about $16,647,500) for new construction, extensions in electrification program, new equipment, etc.; close to 238,200,000 fr. (about $45,972,600) for new buildings and structures, new lines and other work.

**Eastman Kodak Co.,** Kodak Park, Rochester, N. Y., has purchased through subsidiary, Kodak A. G., Berlin, controlling interest in Nagel Camera Works, Stuttgart, Germany. Dr. August Nagel, heretofore head of Nagel company, will continue as general manager of Stuttgart works.

**Australian General Electric Industries, Ltd.,** Melbourne, Australia, has been organized by Associated Electrical Industries, Ltd., London, England, and International General Electric Co., 120 Broadway, N. Y., affiliated with General Electric Co., Schenectady, to take over plants and manufacturing operations of Australian Electrical Mfg. Co., Ltd., Australian General Electric Co., Ltd., Edison-Swan Electric Co., Ltd., Ferguson Pailing, Ltd., and Metropolitan-Vickers Australian Proprietary, Ltd. Consolidated organization will carry out development program.

**Société de l'Energie du Rhin,** Kembs on Rhine, Alsace, France, has work under way on power dam on Rhine River, about three miles from Basel, Switzerland, for hydroelectric power development and plans early erection of generating station. Plant will have initial capacity of 33,000 hp., divided into six generating units. Transmission line will be built. Cost over $3,500,000.

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## New Trade Publications

**Recorder-Controllers.**—Bristol Co., Waterbury, Conn. Catalog 4001 devoted to temperature and pressure recording and controlling instruments operating by the company's free vane air system.

**Small Motors.**—Wagner Electric Corpn., St. Louis. Loose-leaf bulletin No. 167 describing single-phase, polyphase and direct-current fractional horsepower Wagner motors.

**Gate Valves.**—Reading-Pratt & Cady Co., Bridgeport, Conn. Sixteen-page booklet describing to new Lubrotite gate valve which has a duct system for introducing a lubricant seal between the seating surfaces to provide tight seating, less corrosion and easy operation.

**Welding and Cutting Equipment.**—Bastian-Blessing Co., 240 East Ontario Street, Chicago. Forty-page pocket booklet No. 57 devoted to torches, regulators, gas economizers, acetylene generators and various accessories. Chapters giving general information on welding equipment are included.

**Aluminum Finishes.**—Aluminum Co. of America, Pittsburgh. An eight-page booklet describing the standard finishes recommended for exterior and interior architectural use of "Alcoa" No. 43 alloy sand castings. The finishes include "as cast," coarse, medium or fine sand blast, deplated, high light, oxidized high light, wire brush and satin finishes. The publication is intended to give sufficient information to permit duplication of the various finishes.

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